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OCTOBER 2, 1959

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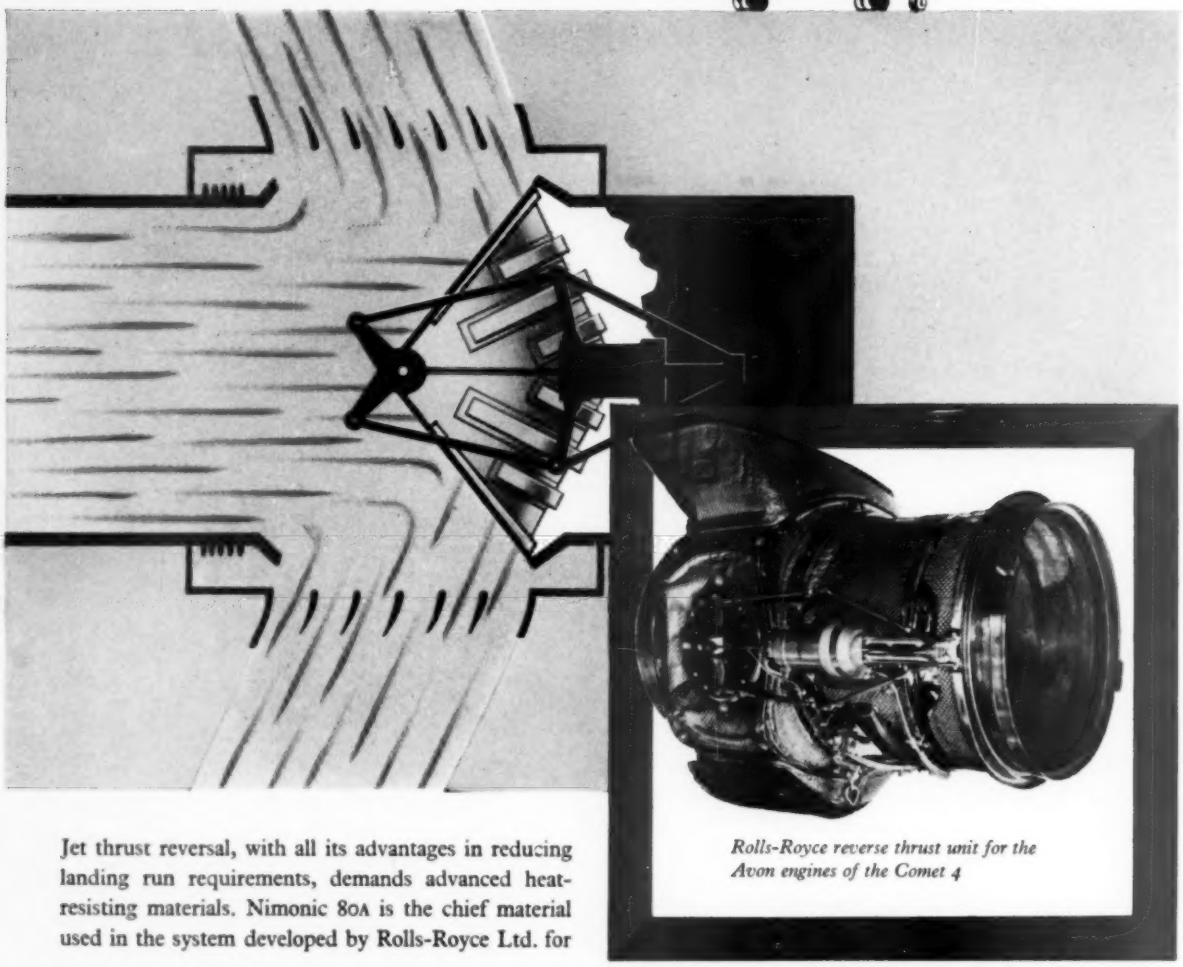

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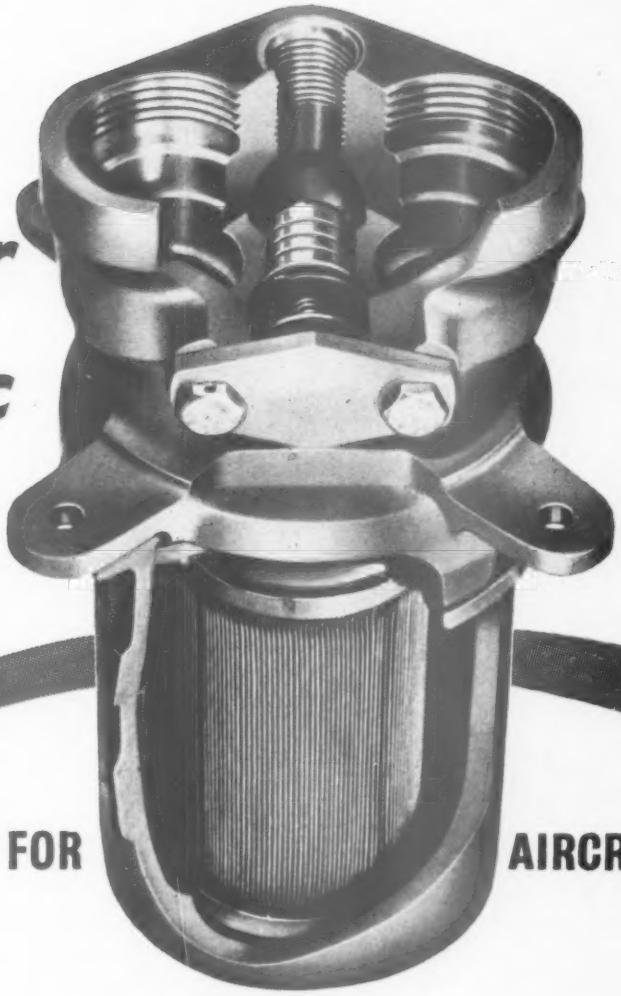

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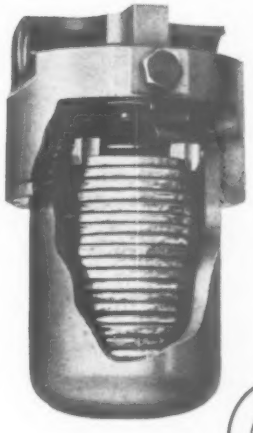

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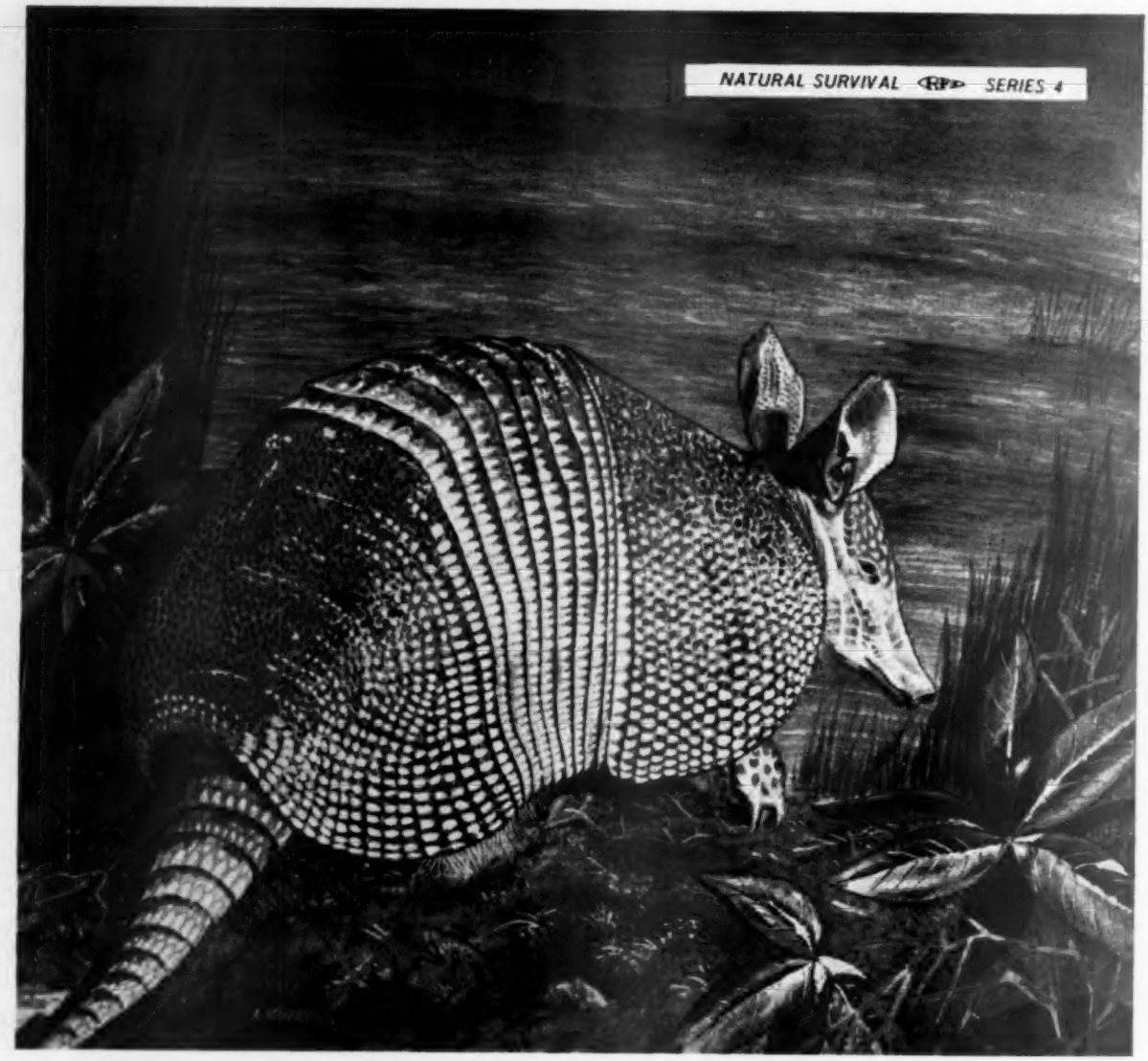

Armadillos AMPHIBIOUS

The day the nine-banded armadillos of South and Central America decided to spread northwards, they set themselves a problem. For all practical purposes they're landlubbers—and with that heavyweight in overcoats who could imagine otherwise? So naturalists and other folk were pardonably puzzled when *Dasypus novemcinctus*—in order to ensure their survival and relieve the acute overcrowding of their natural habitat—suddenly appeared in places which left behind them many a wide, fast river. For a long time the popular theory, having discarded wild ideas of snorkels and such aids, was a d-e-e-p breath and a painful walk on the bottom. It was later seen, however, that these animals had actually achieved efficient flotation. On entering the water they first paddled with heads just breaking the surface and then started to gasp. Each gasp pumped-up the intestine which, fully inflated, became an internal 'Liferaft'.

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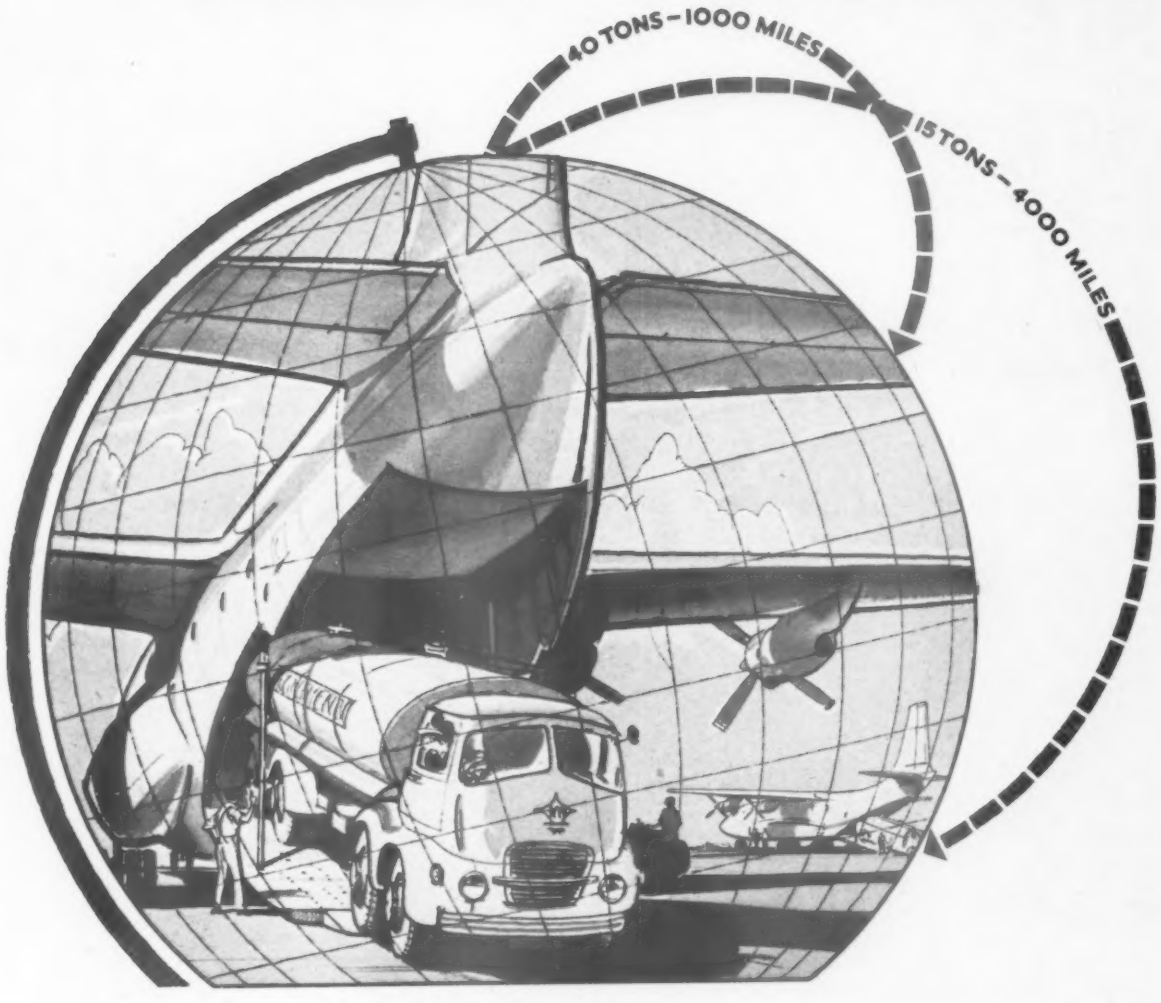

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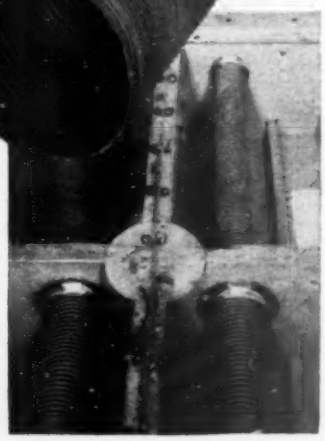

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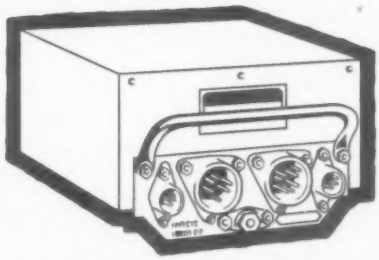

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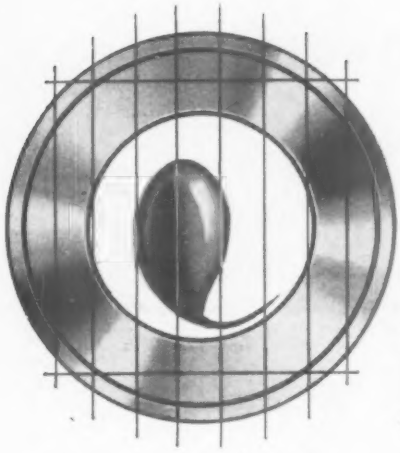

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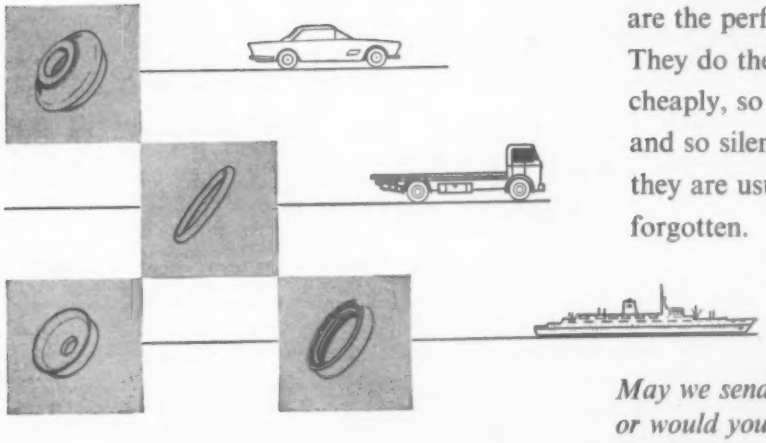

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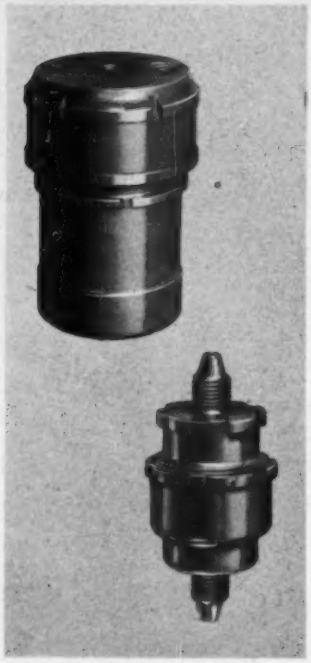

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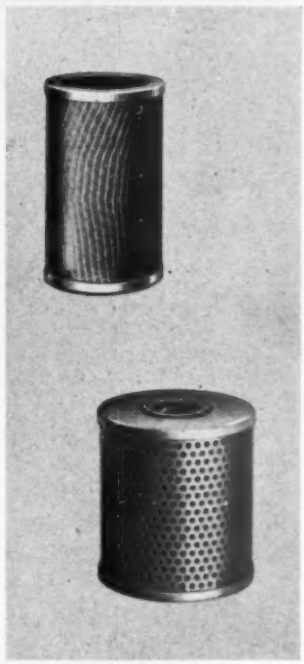

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THE AEROPLANE and ASTRONAUTICS

VOLUME 97 NUMBER 2502 OCTOBER 2, 1959

U.S.A.F. into U.S.S.F.?

Distant rumblings of dissatisfaction in the American astronautics camp have been heard for some time, and following swiftly upon the heels of the Russian success with Lunik II, comes news that sole responsibility for space-boosters is now to be vested in one Service—the U.S.A.F. This would seem a step towards the day when it becomes the U.S. Space Force.

Projects worth hundreds of millions of dollars, including the Army's Saturn booster of 1.5 million lb. thrust, will thus be turned over to the Air Force. Henceforth any specialized satellites that the Army and Navy develop "for such purposes as navigation and communications" will be sent aloft by the U.S.A.F.

By thus ending inter-Service rivalry in ballistic hardware, the Americans hope that their space programme will proceed more effectively and at less overall cost. Nevertheless, much sympathy will be felt for the U.S. Army in particular, which, with its expert ex-German team under Dr. Wernher von Braun, pioneered the American space-effort with Explorer and the first successful Pioneer moon-probe.

What is to become of this group is undecided as yet. In the best interests of space-science it would seem desirable to maintain it intact. Few would deny that most of the best ideas, as well as solid engineering achievement in the U.S. space effort, have derived from the Army Ballistic Missile Agency at Huntsville.

Closing the Triangle

Scores of thousands saw a fine show of flying at Biggin Hill during the Battle of Britain display. Many times their number must have seen the television rendering of the occasion with Charles Gardner doing the commentary. There can be no doubt that everyone was impressed by the performance of the Army Air Corps pilots in the Westland-Saro Skeeters. Their three-dimensional drill in close formation is the modern equivalent of the time-honoured terrestial ceremonial drills with which Army units have delighted so many generations.

People who saw the Biggin Hill show, either on the airfield or on television, will certainly have asked themselves why the Army Air Corps team were not seen at Farnborough this year when the Royal Air Force and the Royal Navy provided notab'e contributions. Their presence would have closed the triangle and given the S.B.A.C. Show tripartite Service support.

And since the Army's requirements for the future are not limited to helicopters, even very big ones, there is one reason more for representation of the Army as a vital link in the development of long-range strategic transports and all that implies for the future of our sales in the commercial markets of the World.

We have already remarked on the likelihood of the Farnborough Show getting rather more like the old R.A.F. Displays at Hendon. In pre-war days, on this essentially R.A.F. occasion, both the Naval Flycatchers and the Army Co-operation Atlases or Audaxes formed outstanding items in the programme.

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Matters of Moment

Arabian Peninsula Command

AIR CHIEF MARSHAL SIR HUBERT PATCH, K.C.B., C.B.E., took over the appointment of Commander-in-Chief, British Forces Arabian Peninsula, from Air Vice-Marshal M. L. Heath on October 1. In his new post, which for the first time since the 1939-45 War marks the establishment of a major inter-Services overseas command, Air Chief Marshal Patch will be in overall command of three individual Service commanders of Major-General or equivalent rank.

Upgrading of the overall commander by two ranks shows the importance attached to this new pattern of the unified command system. The Air Ministry's realization of its significance can be measured by the fact that Air Chief Marshal Patch's posting comes only six months after his dual elevation—to the Air Council as Air Member for Personnel and promotion to Air Chief Marshal.

Air Chief Marshal Patch takes to his new command good knowledge and experience of recent Middle Eastern affairs. This derives from his three years as Commander-in-Chief, M.E.A.F., which post he vacated last March. His term in Cyprus was undoubtedly the most eventful and turbulent since the War, including Suez, the withdrawal from the Jordanian airfields, the return of British forces to Jordan by air and the coup in Iraq.

Air Chief Marshal Sir Hubert Patch who, as recorded on this page, has become C.-in-C., British Forces Arabian Peninsula. Air Member for Personnel since April, 1959, he was appointed C.-in-C. M.E.A.F. in September, 1956. Previously he was A.O.C.-in-C., Fighter Command.

An S-62 in London

LATEST of the many different types of helicopter which have used the Westland Heliport at Battersea since it opened in April is the Sikorsky S-62. This turbine-powered amphibious helicopter, which created so much interest with its demonstrations in and out of the big water tank at the Paris Aero Show, flew into London on September 23 from Brussels. Since its appearance at Paris, the S-62 has been demonstrating in various European countries.

This was one of two prototypes of the S-62 which made its first flight in May, 1958. No attempt had been made to furnish the cabin to airline standards, the object of the present tour being primarily to demonstrate the aircraft's performance. Points which particularly impressed those who saw the S-62 perform at Battersea were the relative quietness of the General Electric T58 turbine, the high cruising speed and the manœuvrability on the water—full-circle turns were made in each direction in little more than 50 ft.

The S-62 is a derivative of the Sikorsky S-55 (which is produced by Westland Aircraft as the Whirlwind), and makes an interesting comparison with the Gnome-Whirlwind shown at Farnborough, since the Gnome is itself the T58 built under licence. Many parts are interchangeable between the S-55 and S-62, although the latter has a wholly new power system and a new hull design for amphibious operation. Common to both are the main and tail rotor heads and blades, the main, intermediate and tail gearboxes; shafting; tail rotor pylon and major portions of flight control and hydraulic systems. This makes the S-62 attractive to S-55 operators, and Los Angeles Airways has, in fact, become the first to order the S-62, for delivery early next year. Options to purchase S-62s have also been placed with Sikorsky by several charter and general operators, all of which already use the S-55.

In airline use, the S-62 will carry up to 10 passengers, with provision for a crew of two; rapid conversion to mail or cargo transport can be made. As many as 12 troops can be carried. The large freight-loading door of the S-55 is retained and the usual winch can be fitted.

Certification of both the S-62 and its T58 engine is expected next month. Flight tests have enabled Sikorsky to improve on their original performance estimates (see THE AEROPLANE for May 30, 1958) and the high speed is now given as 124 m.p.h., and cruising speed 115 m.p.h. With a gross weight of 7,500 lb., the S-62 has a useful load (pilot, fuel, payload and optional equipment) of 2,950 lb., and will carry its full payload over a 270-st.-mile sector (with 10% reserve fuel).

MANŒUVRABILITY.—During the recent visit of a Sikorsky S-62 to the Westland Heliport (recorded on this page), its excellent manœuvrability on the water was demonstrated; here it displays its very small turning circle.

Photograph copyright "The Aeroplane and Astronautics"

AMPHIBIOUS.—As its flying-boat hull suggests, the Sikorsky S-62 single rotor helicopter is fully amphibious. It is powered by a General Electric T.58 shaft turbine and can carry 10 passengers.

Photograph copyright "The Aeroplane and Astronautics"

U.S. Interest in Woomera

AMERICAN interest in Woomera as a missile and space-research centre was foreshadowed at the Commonwealth Spaceflight Symposium in London last month, and from Canberra it is now reported that a tripartite agreement may be signed between Australia, Gt. Britain and the United States which would permit the Americans to use the Woomera range facilities. Hence the recent visit of Mr. McElroy, U.S. Secretary of Defence, and Gen. Thomas D. White, Chief of Staff, U.S.A.F.

Understandably, the Australians are very keen to see the Anglo-Australian range developed to its full capacity, for in the long term this would mean a big expansion of industry in Salisbury and other centres concerned with rocket servicing and maintenance. In any collaborative effort with the Americans, it would be expected that a large part of the supporting facilities would be in the hands of the Australians.

The Woomera range has cost about £70 million to date and the annual expenditure is now running at about £15 million, some £9,500,000 of which comes from the Australian Government.

Major extensions of the range facilities from Woomera to Port Hedland, on the north-west coast of Australia, have been in hand for some time in preparation for the launching next year of the Blue Streak LRBM. Launching sites for Blue Streak are being constructed some 20 miles from Woomera village near Hart Lake where, amid launching emplacements, observation and control posts, a complete liquid oxygen production plant is nearing completion.

Apart from the interest in Woomera as a launching site, its value as a tracking and communications link for artificial satellites has been acknowledged the World over.

No Future for Mach-3 Fighter

DEVELOPMENT of the F-108 Rapier, the long-range Mach-3 interceptor being developed by North American, was cancelled by the U.S.A.F. on September 23. The cancellation was stated to be an economy measure, but was probably also made because ballistic missiles are likely to be a greater threat in future to the U.S. than manned bombers. According to the U.S.A.F., priority must go to long-range weapons, combat readiness and improved systems to give warning of enemy attack.

This decision will be a heavy blow to North American; it must also cast further doubts on the future of the B-70 Valkyrie. This Mach-3 bomber is being developed by the company in parallel with the F-108; the same advanced powerplant, the General Electric J93 is scheduled for both aircraft, which are believed to have a similar delta configuration. Only recently contracts for boron-based fuels for these aircraft were cancelled as was the special version of the J93 designed for these fuels. Development of the J93 for conventional fuels will continue.

The future of the Valkyrie has very important implications for supersonic airliners; if this aircraft goes ahead, the U.S. industry will gain invaluable practical experience of propulsion, and structural and operating techniques for large Mach-3 aircraft. But there is considerable doubt about the future of this $175-million aircraft.

The R.A.F., R.N. and Army bases of the inter-Service Arabian Peninsula Command. As indicated by the key, a number of stations are not permanently manned. The scale is approximately 500 miles to the inch.

Battle Day at Biggin

EXCELLENT flying was seen by the vast crowd attracted to Biggin Hill for Battle of Britain Day on September 19. Some of the items were straight out of Farnborough, but many others were new and of a quite original character.

Outstanding was the display by four Saro Skeeter helicopters of the Army Air Corps from Middle Wallop, which held the spectators enthralled with their agility, cavorting in dancing troupe pattern, flying backwards in formation and pairs threading through each other's tracks.

Three Vampires from Linton-on-Ouse set the flying programme off with an impeccable display of aerobatics and a little later two Tiger Moths did a pupil and instructor act which, for dialogue coupled with some crazy flying, was the funniest that one has ever seen.

A reheat Swift FR.5 from 2nd T.A.F. gave an individual display of aerobatics and high-speed flying which must have surprised many people who are taken in by the stories that this low-level strike and P.R. aircraft was a waste of public funds. Such people probably do not even know that there are two squadrons in first-line operation with the R.A.F. in Germany.

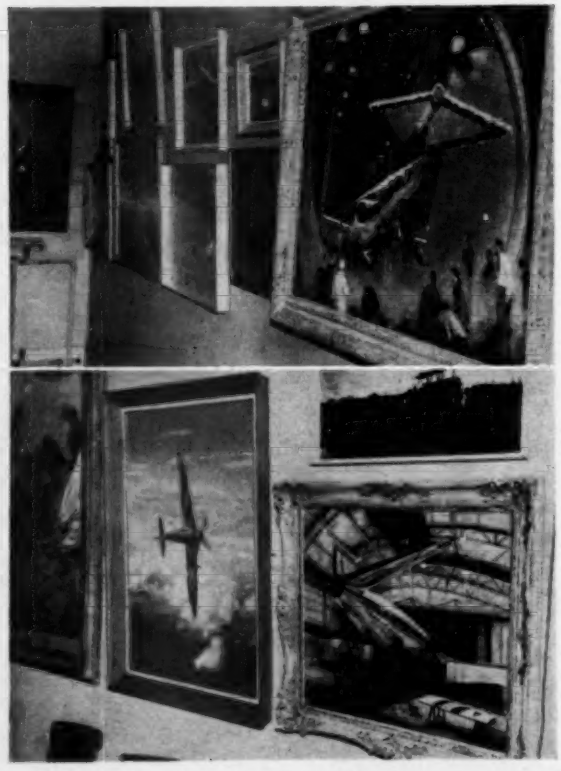
Sqn. Ldr. Peter Latham with an abbreviated 111 Squadron thrilled the customers in no uncertain manner with faultless smoke and patterns. His deputy, Flt. Lt. Brian Mercer, was leading another pattern-weaving half-squadron in the North.

Jeff Quill and Bill Bedford in Spitfire and Hurricane put up their tearing and nostalgic demonstration, which was repeated by them at other stations during the afternoon.—C.A.S.

Victor 2 Investigations

A SEARCH of the sea-bed off the Pembrokeshire coast and a special pressurization test on a Victor 1 bomber prototype form part of the investigations into the loss of the first Victor B.2, which disappeared on August 20 during a test flight from Boscombe Down. This aircraft apparently disintegrated at very high altitude.

The under-water search is the largest and most difficult ever made by the Royal Navy for an aircraft lost off British shores. It is being made about 60 miles S.W. of Milford Haven, in the St. George's Channel. The water there is about 300 ft. deep. The search is hampered by currents, a difficult sea bottom and poor underwater visibility.



AVIATION ARTISTS.—A wide range of subjects are evident at this year's show at Guildhall.

ARMY AIR DRILL.—The four Skeeters during their show at Biggin Hill.

The Royal Navy has some seven ships there—a frigate, survey, deep-diving and wreck-disposal vessels, and two minesweepers. These are being aided by an R.A.F. launch and six trawlers using nets and wire sweeps.

The pressurization test is to be made because two escape hatches became detached from a Victor 1 during a test flight from Boscombe Down on September 3. The tests will be made at the R.A.E., Farnborough, using the second Victor 1 prototype. This aircraft, which is in many ways unrepresentative of production Victors, has until recently been put "out to grass" at Radlett Aerodrome.

Air Artists

MANY of the artists whose pictures have so often delighted the eyes of readers of this weekly newspaper are represented at the Sixth Exhibition of the Society of Aviation Artists at Guildhall, London, open until Oct. 10. This year the addition of Service artists from the R.A.F. not only increases the interest of the exhibition, but demonstrates that the amateurs merit having their work hung alongside that of the professionals.

For subject there is something for everyone's taste. Ballooning at the turn of the century, recollections of flights over the lines during the First World War, dramatic action in the Second World War, modern transport aircraft and aerodromes, and at least one test laboratory scene.

An essay into meteorology by Keith Shackleton, "Unstable Elements" attracts attention by its dramatic grouping of a herd of elephants under the lowering sky. This year Mr. Shackleton has no portrait on show, which is a pity; the more so since portraits are not well represented this year.

David Shepherd's pictures range between a study of a Messerschmitt shot down in an idyllic cornfield in the sunny September of 1940, to a remarkable study of Westminster and the River as from a helicopter. Roy Nockolds has a splendid symbolistic study "Tight Turn" to contrast with his studies of aircraft which are so well known.

Pamela Drew has a problem picture of an independent airline operating company's hangars and aircraft, seen through barbed wire. She also has an interesting experiment which, perhaps, does not quite come off, of a fighter painted on polished aluminium.

Mr. Egerton Cooper has a dominating study in orange and blue-greys of an aircraft being removed from an altitude test chamber at Weybridge. Mr. Harold Dent is experimenting with specially interesting attempts to convey impressions in various phases of flight.

Aerodrome Owners at Bristol

INDEPENDENT air transport operations and helicopter services were the two principal subjects for discussion at this year's annual conference of the Aerodrome Owners Association—held at Bristol at the end of last week. Mr. J. E. Rylands, president of the British Independent Air Transport Association, ably stated the case for, and explained some of the problems of, the Independents; and Mr. P. W. Brooks, A.C.G.I., A.F.R.Ae.S., technical assistant to the chairman of British European Airways, presented a comprehensive review of transport helicopter development in this country. And in addition to these organized sessions, the 120-odd delegates took full advantage of the annual opportunity to discuss among themselves their many common problems.

During the two-day Congress the delegates enjoyed the hospitality of the Lord Mayor of Bristol, of Shell-Mex and B.P. and of the Bristol Aeroplane Company. And to add practical point to their talks they visited Lulsgate airport, the Bristol Aircraft Company, Bristol Siddeley Aero Engines and the Bristol helicopter division at Weston-super-Mare.

The Conference proper was set off to a good start by a speech of welcome from the Lord Mayor of Bristol, COUNCILLOR W. G. COZENS. He spoke of Bristol's close links with the development of transport through the ages and referred particularly to the city's association with the A.O.A.; it was a Bristolian, Mr. Ashley Hall, who had been its founder.

In his talk to the delegates, MR. RYLANDS suggested that both B.I.A.T.A. and the A.O.A. had to work closely together if they were to succeed in their appointed tasks. After giving a brief account of the history of post-war independent air transport operation in the U.K., he outlined its more recent achievements. Since 1953, for example, the number of passengers carried on scheduled services and inclusive tours had increased three and a half times—from around 280,000 to a little under a million passengers. The total passenger figures showed a threefold increase (from ½ to 1½ million).

The Independents' more spectacular efforts had, however, been in the international field. The industry had, he said, created an entirely new class of traffic, for it had been B.I.A.T.A.'s members who had made possible international air travel on inclusive tours.

So far as domestic internal traffic was concerned, the increases had mainly been on the routes to two holiday islands. To the Channel Islands, for example, traffic carried between 1953 and 1958 had increased fourfold; Isle of Man traffic during the same period had doubled. The number of passengers carried on other services had gone up from about 9,000 to 32,000.

Speaking of the profitability—or otherwise—of internal scheduled services, Mr. Rylands said that by and large B.E.A.'s internal-route services did not show a profit. He felt that members of B.I.A.T.A. could operate them more economically.

On this score he felt that a very close look should be taken at the whole future of these internal air services. Such a survey should take in the whole country and not deal with the routes piecemeal. He proposed that a working party be set up by the two Associations to undertake this study.

Mr. Rylands also had something to say about the problem of the petrol tax and drew attention to the anomalous situation in which passenger boats plying between the mainland and the Isle of Man were not subject to fuel tax, whereas aircraft flying the same route were taxed. He made a strong plea for the A.O.A.'s support in urging the reduction of this petrol tax, which was such a burden to the independent operators.

In the subsequent discussion period, the conference chairman, ALDERMAN V. J. ROSS, who is chairman of Bristol's airport committee, said that the city had spent £¼ million on its Lulsgate airport. If more operators could be persuaded to use it they might be prepared to spend another £¼ million.

MR. BROOKS' contribution to the proceedings took a somewhat different form, in that he displayed a number of most instructive slides and talked "off the cuff" about each. After some illustrations indicating how the helicopter is best suited to short-stage operations and how its operating cost compares with that for fixed-wing craft, he showed that B.E.A.'s main passenger services were over routes of less than 300 miles. The figures on his slide indicated that 60% travel over this sort of distance; 30% from 300-700 miles; and about 10% over more than 700 miles. As the helicopter showed to advantage over distances of less than 300 miles, these figures, he said, explained B.E.A.'s close interest in such craft.

He cast a slight shadow over the hopes of those who want to see internal routes served by helicopters, by saying that it was the over-water routes—between the U.K. and Continental cities—that would be the most promising and would be the first to be operated when the new generation of large, economic, rotary-wing craft became available. Internal services would be in competition with surface transport and would not be so economically attractive; such services would be developed later. He sugared this pill, however, by saying that B.E.A. were considering helicopter services between Land's End and the Scilly Isles, between London Airport and Gatwick, and between London's centre and London Airport.

FRONT SEAT.—This striking shot of the Canberra PR.9 produced by Short Bros. and Harland, Ltd., with a hinged nose for access to and from the observer's seat, shows the front occupant in place. The Canberra PR.9 was a late entry at the S.B.A.C. Show and was flown by Mr. A. Roberts—seen here getting into the cockpit.

Air Transport

M.E.A. and B.O.A.C.

SOME time ago the Minister of Transport and Civil Aviation, referring in the House to Middle East Airlines, a B.O.A.C. subsidiary, said that "we cannot go on with the drastic losses in this company and that matters must either be wound up or some different arrangement come to." During a debate M.E.A. was described as "one big sieve through which public money has been poured."

Not unnaturally, these comments were picked up and given prominence and no one—not even B.O.A.C.—troubled to put the facts into better perspective. The public, informed and otherwise, have consequently been left with the impression that M.E.A. is an inefficient airline and that the Corporation is paying for its losses out of public funds.

The fact seems to be that B.O.A.C. has arranged loans, amounting to about £5 million (£3 million for equipment and a £2 million funding loan), and that M.E.A. is regularly paying interest on these loans at the rate of 6% at monthly intervals through the IATA Clearing House in London. No direct payment has so far been made by the Corporation for any losses sustained. On the contrary, B.O.A.C. is receiving considerable sums in interest, as well as enjoying protection of traffic rights (assessed at about £1½ million per annum) and feeder business (assessed at £300,000 per annum).

During the past five years M.E.A. has been expanding at a very fast rate—and expansion requires capital for new equipment—and has certainly been through an extremely difficult period because of the political disturbances in the Middle East area. The regional (and profitable) DC-3 operations of 1954 have been extended to international operations through Europe and into the Indian subcontinent with a fleet of seven Viscounts and four DC-3s. The relative growth can be judged by noting the increase in capacity ton-miles from 4,502,000 in 1955 to 26,751,000 in 1958, and of revenue from £755,000 to £3,072,000. As for relative efficiency, M.E.A. states that its cost per C.T.M. worked out at 32.9d. in 1958—which is probably lower than that for any European operator. For comparison in 1957 B.O.A.C.'s own average costs were 39.1d. and B.E.A.'s were 39.6d.

So much for the direct facts. It is for B.O.A.C. to decide whether the investment is a good one for the future. Evidently the Corporation thinks so, because it has refused a recent M.E.A. offer to buy B.O.A.C.'s shareholding for cash and to repay, over agreed periods, all the loans in return for a refund of the direct profits made by the Corporation in its dealings with M.E.A. since 1955.

It should be emphasized that the re-equipment loan of £3 million, payable over eight years, is a normal requirement for an expanding airline; only the £2 million funding loan, which is bank-guaranteed, can be considered as reflecting the airline's difficulties. In the M.E.A. offer the funding loan was to be repaid over three years with a bank guarantee, and that of the equipment loan for eight years from 1960.

Obviously there are risks as well as advantages in the liaison. The Corporation admitted, in its evidence before the Select Committee on Nationalized Industries, that there were good commercial prospects for M.E.A.—which has been doing very much better this year. M.E.A.'s chairman and managing director, Sheikh Najib Alamuddin, made it very clear in London last week that B.O.A.C. is, in its turn, a tremendous asset to M.E.A., which would be very reluctant to come to a similar agreement with any other airline.

On the other hand, M.E.A. feels that it must, for a number of political and other reasons, remain predominantly a Lebanese undertaking—and the outsider has little sympathy with the idea that all would be well if the Corporation obtained complete control. M.E.A. may have lost heavily last year, but B.W.I.A., which is a wholly owned Corporation subsidiary, probably lost nearly as much.

The major problem for the M.E.A./B.O.A.C. partnership just now is much concerned with re-equipment. When economy class fares are agreed by IATA for areas additional to the North Atlantic, M.E.A. will need larger (and British) aircraft—not only because of the increased traffic, but because Viscount 700s are too small for mixed-class operations.

The present shareholdings in M.E.A. are: B.O.A.C. 49% and Lebanese interests 51% (of which 20% is held by employees).

M.E.A. TRAFFIC RESULTS—JULY, 1959

	July, 1959	July, 1958	Variation
Capacity ton-miles offered ..	21,614,000	20,283,000	+ 6.6%
Load ton-miles sold	14,924,000	12,606,000	+18.4%
Revenue load factor	69.0%	62.2%	+10.9%
Passengers carried	412,633	360,788	+14.4%
Passenger-miles flown ..	143,115,000	122,000,000	+17.3%
Passenger load factor ..	73.2%	66.6%	+ 9.9%
Freight ton-miles	1,056,300	897,300	+17.7%
Mail ton-miles	303,900	317,800	— 4.4%
Aircraft miles flown ..	4,314,400	4,161,500	+ 3.7%
Revenue hours flown	22,852	22,968	— 0.5%

The continued progress of B.E.A. can be seen in these latest monthly traffic figures. The big increases in ton-miles and passenger-miles sold, when matched against the relatively small increase in capacity offered, are reflected in the respective load factors of 69% and 73.2%—which are high even for a peak summer month. The freight increase is noteworthy.

The Hard Facts

A RECENT "live" B.B.C. television programme* offered some usefully plain speaking about cheaper air travel, the supersonic transport and the British aircraft industry's civil prospects. The subject was the Vanguard and interviewed were Sir George Edwards (for the manufacturer) and Lord Douglas and Mr. Jack Dyment, of Trans-Canada Airways (for the operators).

Asked, in effect, why the Vanguard was not yet selling in the quantities necessary to reach break-even point, Sir George said that one reason was the fact that it was not yet in operation. Another was "this sort of hysterical situation about using jets . . . you don't have propellers on and everyone gets emotional about going a bit quicker. Whether it costs any more to go quicker seems to be rather secondary. . . . The Vanguard is designed to have maximum economy. By international agreements, and one thing and another, it doesn't get the chance to use it. It's just the same as building a fast aeroplane and putting a speed limit on it. There's no difference in philosophy so far as I can see. Don't understand it."

Mr. Dyment's answers to a similar question were: "A number of airlines have such competitive services that speed is the be-all and end-all and these airlines dare not buy an aeroplane that might be a little bit slower under certain conditions on the possibility that the competitor might buy a jet. Now there isn't a jet available [in the short-haul class] but there might be and they are just hesitating till they see how the wind blows. The other reason is that a lot of airlines just don't have large enough engineering departments to analyse the designs of the aeroplanes before they're flown and have to wait for the aeroplane to fly and then see the results and make the decisions at that time."

Mr. Dyment had previously explained that Trans-Canada's choice of the Vanguard was based on hard requirements and not on any sentimental or political reasons—"T.C.A. buys wherever it can get the best product for its services regardless of where the manufacturer is located."

Lord Douglas, asked why—since it was an economic aeroplane which could lead to lower costs and lower fares—B.E.A. had not put all its eggs in the Vanguard basket as it had done with the Viscount basket, explained that "we've now got to the jet era, and our competitors are flying across Europe in jets. Now on short distances it doesn't matter, the Vanguard is quite reasonably fast, but on our longer routes we do definitely need jets in order to compete with our competitors." B.E.A. could not ignore speed for the sake of economy—not, at least, on the longer routes. He did not have the opportunity of explaining the international fare-agreement difficulties which, so far, prevented any prospect of "going it alone" with a lower fare structure.

When Sir George was asked what could be done about the Vanguard sales prospects, he pointed to the problems of the British industry with its limited market. The Government understood the problem and, in the recent debate on the industry, the Minister of Supply had said: "The purpose of Government support must not be to shore up the weaknesses

* "The £1,000,000 Seat": September 3, 1959.

Photograph copyright "The Aeroplane and Astronautics"

"The Vanguard," said Sir George Edwards in the broadcast quoted here, "is designed to have maximum economy. By international agreements, and one thing and another, it doesn't get the chance to use it. It's just the same as building a fast aeroplane and putting a speed limit on it."

of the industry but to reinforce the points of strength." Sir George did not think that any serious-minded man in the industry would quarrel with this view.

Of supersonic transports, he said that the optimism about such prospects was "the usual optimism that absolutely bedevils the industry. You take the case of the 707: it is based on an aeroplane, a bomber, the B-47, that first flew 12 years ago and the 707 is just beginning to operate and it has its troubles. Well, now you take the supersonic aeroplane that the Americans will probably build, the 2,000-m.p.h. thing. That, in turn, will have to be based on the experience of a bomber that they are building, which, it is reported, is going to fly, say, in 1963." It had, he said, taken 12 years to develop the 707 from a comparable bomber, and it certainly was not going to take less time to develop a 2,000-m.p.h. aeroplane.

"So, 1963 plus 12 = 1975. But, the point here, of course, is that it's the Americans that have got this thing, and we don't have a bomber of this type to go for and, so far as I'm concerned, I think it's a race that we shouldn't even try to take part in now."

Sir George agreed that there was a future for this type of aeroplane, but added: "If there is one thing that isn't going to happen that is the advent of a 2,000-m.p.h. aeroplane bringing seat-costs down. They certainly won't do that. Tycoons on an expense account might use it, but the sort of mass travel that is going to be the life-blood of the airlines for the years to come will have to rely on this sort of aeroplane [the Vanguard] on short ranges and the big subsonic jets on the long ranges.

Later he said in a recorded statement that his advice to the industry was "just to build aeroplanes that we will be able to sell, without any sentiment, but on their merits. I don't believe there's any sense in just running after prestige in things like supersonic aircraft. I believe that real prestige comes in showing the maximum number of people what we can do best. And the thing that we can do best in the aviation game—and I believe we can do it better than the Americans can—is to design aeroplanes that have got good airfield performance. We go on doing that and I think we've still got a future . . . ."

European Co-operation

THE Air Research Bureau, which held its 26th assembly of airline presidents in Hamburg on September 11, now has 11 full members. These are Aer Lingus, Air France, Alitalia, B.E.A., B.O.A.C., Lufthansa, Iberia, K.L.M., Sabena, S.A.S., and Swissair; two associate members are Finnair and Icelandair (Flugfelag Islands). So very nearly the whole west European airline strength (or 90% of the intra-European international traffic) is represented, including the four members of Air Union—Air France, Alitalia, Sabena and Lufthansa.

At the meeting under the chairmanship of Mr. H. M. Bongers, Lufthansa, the current work programme and the activities of the various specialist study groups were reviewed by the secretary general (Mr. Victor Gore) and a provisional programme for 1960 was approved. The next assembly will be in Rome on March 7, 1960.

The aims of the A.R.B., which was established in 1954, are to improve and develop European air transport by means of specialist studies, statistical surveys and overall co-operation. The Bureau is based in Brussels (67 Rue de la Loi) and the primary agency is the assembly of presidents, which meets at least twice a year. Liaison between the Bureau and member carriers is maintained by means of a preparatory committee consisting of the secretary general and nominated airline members.

To some extent, therefore, the formula is similar to that of Air Union, which, after meetings of five airlines (K.L.M. was then involved), starting towards the end of 1958, was formed in May this year. Originally called Europair, Air Union was, in effect, initiated in November, 1957, when Lufthansa suggested to Air France that the two airlines, with Alitalia, Swissair and Sabena, might usefully collaborate. The memorandum from Lufthansa included statistics of prospective traffic potentials in the different countries. Air Union has a permanent secretariat in Paris (43 Avenue Franklin Roosevelt).

The aims of Air Union are those of increasing competitive ability and of organizing a joint policy on sales, traffic and equipment. It has an executive committee, with sub-committees to recommend planning, sales, technical and traffic policies. The executive committee is, in fact, a presidents' conference and an executive board of nominated representatives looks after, through a programme board, the planning of the sub-committees. The secretary general is a representative of Air France.

At the meeting last May (see our issues of June 5 and 12, pp. 640 and 666) future intra-European traffic quotas for the four airlines were agreed as 34% for Air France, 30% for Lufthansa, 26% for Alitalia and 10% for Sabena.

Recently, the German Minister of Transport, Dr. H.-C. Seebohm, said that Air Union should be in action by 1961 and stated in so many words that the organization was necessary to compete with the American operators of turbojet and future supersonic transports, the cost of which was too great a strain on the resources of smaller companies.

In an article in *The Financial Times* survey of aviation last month, M. Max Hymans, president of Air France, said that it was hoped that Air Union would be operating all the international scheduled and non-scheduled services of its members by April 1, 1960. He also said that it would not be a "closed shop"; when Air Union is launched "it will be with the strong hope that other airlines will join us . . . ."

At the conclusion of his article, M. Hymans said: "Either European airlines will be able to co-operate and expand, or they will shrink to the stage of local airlines, feeders for extra-European carriers. When I say European, I do not mean Continental . . . . The issue at stake is the prosperity of European air transport or its gradual decline."

Air Transport . . . .

Turbojet Take-off Performance

ALTHOUGH the principles and problems of turbojet take-off performance and handling are well understood by the pilots, technicians and aerodynamicists who are directly concerned, they may not be so clearly understood by others. In the latest issue of the Boeing Transport Division's field service magazine, *Boeing Airliner*, there is a clear exposition of the turbojet's take-off performance and techniques, and some information about the effects of the 707's leading-edge flaps.

The article starts with an explanation of the way in which the power developed by a turbojet increases with speed, whereas the thrust developed by the piston-propeller combination falls off as speed increases.

Within a relatively small speed range, as in the take-off régime, a turbojet engine is often referred to as a constant-thrust machine and a reciprocating engine as a constant-power machine. Thus, the 707's thrust changes very little from the beginning of the take-off roll to unstick speed, whereas the 377 Stratocruiser develops its greatest thrust at the start of take-off and its thrust falls off as speed increases. As might be expected, acceleration curves are similar in shape to thrust curves. A 377's acceleration is greatest at the start and falls off until it is accelerating at a slower rate at the beginning of its climb-out. Acceleration of the 707 is nearly constant throughout most of its take-off roll. The jet tends to accelerate more slowly than a piston-engine aeroplane at the start of the ground roll and relatively faster near the take-off point. At slightly more than 80 knots, the 707 equals the acceleration of the Stratocruiser and thereafter accelerates at a faster rate.

These differences in powerplant performance affect take-off planning. The available thrust of the 707 near take-off speed is almost double that available on a reciprocating-engine aeroplane, even though the thrust available at the start is nearly the same. As a result of the fall-off in thrust available for climb at take-off, most piston-powered long-range transports operate close to the gross weight limitations established by their three-engine climb performance capability. Under these loading conditions, a 7,000-8,000-ft. take-off field length is typical under Civil Air Regulations. The jet, because of its greater climb-out performance, can increase its climb-limited gross weight to the point where field lengths of 10,000-12,000 ft. are required for take-off. Jets, therefore, are more likely to be limited by available field length than by their own three-engine climb-out.

The relatively slow acceleration in the early part of a jet's ground roll, and the more rapid acceleration as the take-off speed is approached, create other differences between a jet and a propeller aeroplane. Because of the jet's good acceleration at unstick speed, a jet aeroplane is less affected by an engine failure on take-off. Should a jet engine fail at V1, field length is increased only 9½% over the distance required for a four-engine take-off. A similar failure of a piston-engine aeroplane at V1 increases the field length by 18%.

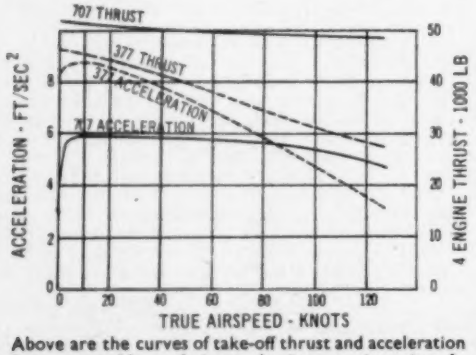
Since C.A.R.s base field lengths for take-off on the distance required for three-engine take-off from V1, the normal four-engine jet take-off will use more of the available runway than a four-engine propeller take-off. A reciprocating-engine aeroplane will normally lift off with 25% of the runway remaining, whereas the jet will have approximately 17% left.

As a summary of the differences between aeroplanes powered by reciprocating or turbojet engines, these points stand out:—

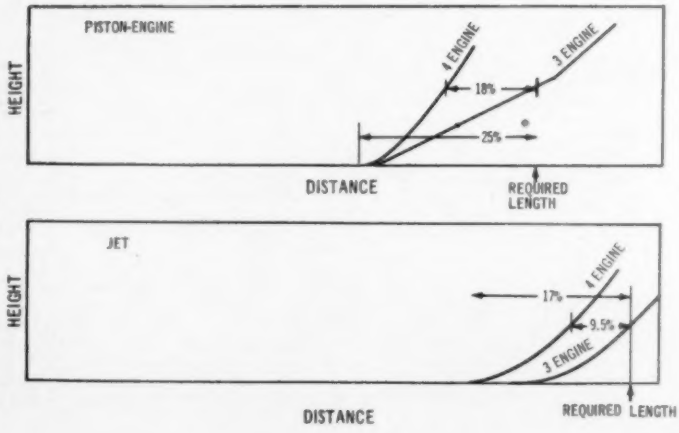
1. Jet transports will normally require somewhat longer field lengths than contemporary aeroplanes.
2. Jet aeroplanes will use a greater percentage of the required runway to reach V1 and unstick speeds than contemporary aeroplanes.
3. After the take-off point is reached, the jet transport will exhibit superior climb-out performance.

Merely changing regulations or increasing take-off field lengths will not, in themselves, assure safe operation under all conditions. Such performance capability must be built into

(Continued on page 281)



Above are the curves of take-off thrust and acceleration for comparable turbojet and piston-engine aircraft. The other curves show take-off and initial climb capabilities. At the head of the page the Qantas 707-138 has a "fifth pod" for powerplant transport.



TOP-FLIGHT APPROVAL

AEROSHELL OIL

W.100

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AeroShell Oil W.100 has been granted unrestricted approval by Pratt and Whitney. What is AeroShell Oil W.100? It is the first non-ash dispersant additive oil for aircraft piston engines. AeroShell Oil W.100 contains a non-metallic additive which is the successful outcome of many years' research by Shell laboratories in both Britain and the U.S.A. Flight evaluation tests of over 180,000 engine hours have shown significant reductions in deposits on engines and filters. To the airline operator this offers a potential increase in overhaul life, reduced wear and lower maintenance costs.

AeroShell Oil W. is available in two viscosity grades— 80 and 100.

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...you can be sure of Shell...

D

The longest queues are for the cheapest seats

It's the same in any country, in any business—lower prices attract more customers. Is the airline business an exception? Certainly not! Millions want to fly. They will fly when they can afford to. And here's practical proof that lower fares do bring *big* traffic increases. Notice that the increase is at least 50% in each instance.

In Britain *Cheap week-end fares put up BEA's 1958 winter traffic to Scotland and Northern Ireland by 50%*

In Europe *Reduction in Inclusive Tours costs have already put up BEA's 1959 tour traffic by over 50%*

Across the Atlantic *Economy Class passengers on the North Atlantic are now 65% of the whole*

In the U.S.A. *'Below Bus Fare' prices on National's Night Coach to Miami have doubled the passenger miles in three weeks.*

HERE IS A BOLD CLAIM.

IT HAS BEEN SHOWN that traffic growth resulting from fare reduction is five times that resulting from a speed increase. The problem is how to offer cheap fares profitably. On short and medium haul, the answer is to operate the Vickers Vanguard. It is the *only* aircraft which can profitably carry the big peak loads which will follow promotional fares, yet break even on fewer than 50 thrift-fare passengers on a 500-mile trip. And it will fill in seasonal troughs by creating new trade.

The figures opposite support this claim!

BRITAIN WANTS AIR TRAVEL FOR THE MILLIONS

Britain's initiative and firmness on the question of cheap fares, and air travel for the millions, is firmly founded in reality. It stems largely from the operational economy and efficiency of the Vickers Vanguard. The case was put clearly by the Minister of Transport and Civil Aviation.

Speaking in the House of Commons on July 16th, 1959, Mr. Harold Watkinson said:

'The next step which the Government propose is to stimulate an upsurge in traffic . . . I want to say, with the Government's full support, that B.E.A. and B.O.A.C., and the Independent airlines, will go to the I.A.T.A. Conference determined to press for a reduction in fares . . . and I say with all seriousness that I hope I.A.T.A. will approve this proposal. If it will not we shall have to reconsider our position in I.A.T.A. . . . May I now turn to the turbo-props? In the Vanguard we have a turbo-prop which is not only much better than its specification but is a very cheap aircraft to operate.'

EUROPE *On a 500-mile sector in Europe the 120/139-seat Vanguard needs only 49 passengers to break even at fares 20% below current tourist rates. At 200 miles the figure is 63 passengers. No freight or mail income is counted.*

U.S.A. *At U.S.A. costs, a four-cent passenger mile would require a Vanguard break even load of only 75 passengers for 500 miles (no freight income), coming down to 48 passengers with capacity freight.*

On New York—Miami (1,100 miles) a 'cheaper-than-bus-fare' rate of 3.21 cents a mile would make a 10% profit with 95 passengers (no freight).

ANY FREIGHT INCOME from the seven-ton capacity cargo space is an added bonus. So is the fact that the 425 m.p.h. Vanguard will equal or better jet block times on sectors up to 500 miles.

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VANGUARD

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Only the Vanguard has *all* these features

425 m.p.h. cruising • Freight capacity 7 to 8 tons at normal densities • Full routeing and A.T.C. flexibility • Can use normal existing airfields • Quick turn-round • No airfield noise problems • Ten years' unique Vickers/Rolls-Royce turbo-prop experience . . . *And it is 'Viscount' quiet.*

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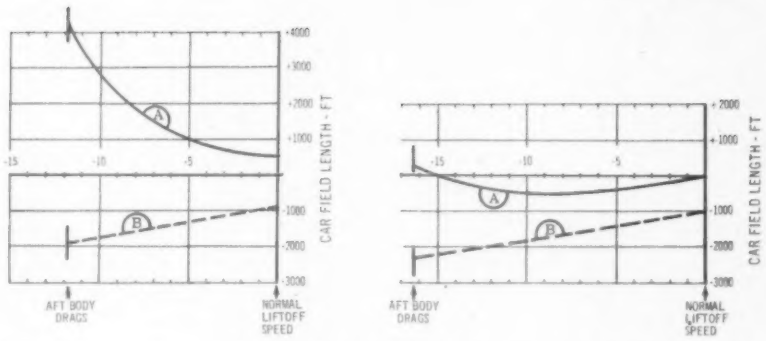
Air Transport . . . .



These curves show the effect of leading-edge flaps (right) on the take-off of the Boeing 707 when (A) mishandled by lifting the nose wheel as early as possible and (B) during a normal take-off with rotation in advance of V2 speed. The transverse co-ordinates show change in lift-off speed in knots, and the vertical co-ordinates show field-length variation from the C.A.R. norm.

(Continued from page 280)

the aeroplane. Long before certification of the 707 was completed, an area of concern developed after studying the take-off characteristics of the jet transport. The jet-powered aeroplane is sensitive to variations in speed and attitude near the take-off point. Rate-of-climb falls off rapidly with a speed reduction below normal take-off speed for a jet compared with a propeller aeroplane.

In 1956 an extensive flight-test programme studied the 707 prototype's tolerance to misuse and mishandling during take-off. During the tests, the aeroplane was loaded to its maximum weight and the power adjusted to simulate the lowest thrust-to-weight ratio at which production 707s would operate during take-off. The aeroplane was then accelerated to take-off using various nose-up attitudes. The object of the tests was to determine if any degree of misuse could significantly increase take-off field length, or decrease climb-out performance.

These tests proved that the 707 performed safely over quite a wide range of conditions before the take-off ground roll was significantly lengthened. Only when the aeroplane's nose-up attitude was increased until the tail was extremely low did the take-off characteristics deteriorate significantly. During these tests, rather spectacular misuse of the flight controls was applied. Abnormal attitude was also quite evident.

Although it was concluded that the aeroplane had more than enough margin to cover practically any situation that might arise in service, it was decided to test changes that would improve the aeroplane so that, even if the tail was lowered to an extreme position early in the take-off run, a successful take-off could be made. Leading-edge flaps resulted from this test programme.

The improvement that these flaps make on take-off performance can be shown for a particular kind of mishandling. In this the aeroplane is rotated to take-off attitude as early as possible and well before unstick speed. Even without leading-edge flaps the roll is extended only a nominal amount unless the nose is raised abnormally high. Unstick may occur five knots earlier than normal, but 1,000 ft. farther down the runway than the calculated C.A.R. field length. As the rotation angle is increased, the field length also increases sharply until, at the angle that will scrape the aft fuselage, the take-off distance is increased by more than 4,000 ft.

With leading-edge flaps the take-off can be accomplished within the C.A.R. take-off field length even though the aeroplane is rotated to take-off attitude as soon as possible and except when it is mishandled to the extent that the aft body scrapes.

Allowing the aircraft to accelerate in taxi attitude, but rotating early, actually reduces the take-off distance for all angles of rotation even without leading-edge flaps. This is the result of the fact that the calculated unstick speed is about 15-18% higher than the earliest speed at which the wheels will leave the runway. With leading-edge flaps the field length when using this [now normal] technique is reduced even more.

The Oldest Airline

Points and pictures from the history of K.L.M. Royal Dutch Airlines, which celebrates its 40th anniversary on October 7

THE fact that a major European airline will be 40 years old next week is surprising, not so much because this very early starter in the airline business, K.L.M., has retained its original identity and name through all the formative years of this difficult industry, but because it reminds us that air transport is still very young and has grown so much in such a relatively short time.

When Koninklijke Luchtvaart Maatschappij N.V.—the title Koninklijke (" Royal ") was granted before its formation on October 7, 1919—operated its inaugural service on May 17, 1920, there were not more than ten active air carriers in the World.

None of them have survived by name, though some of their hereditary descendants exist. Aircraft Transport and Travel, for instance, from which K.L.M. chartered a D.H.16 for this first service, might be considered as a lineal ancestor of B.O.A.C.; Det Danske Luftfartselskab (Danish Airlines), founded in 1918, existed independently until 1948, when it became part of S.A.S.; and Avianca (Colombia) can claim to be a direct descendant of SCADTA, which was also formed in 1919. But K.L.M. is still K.L.M.

With its widespread colonial possessions, the Netherlands was as much in need of a long-haul airline as Britain, and one of the interesting parts of K.L.M.'s history has concerned its development of services to and within the (then) Dutch East Indies and, later, across the South Atlantic. Another is the way in which, cut off from Europe and with Holland overrun during the War, the Caribbean services were vigorously developed—to such an extent that K.L.M. is now very much a " grandfather operator " in this area, with traffic rights beyond any that might have been conceded later on a basis of territorial interests. And, as a third highlight, there is the way in which the K.L.M. services were rebuilt, so soon after the War was over and from a base which had been destroyed, with 18 DC-4s brought over from the U.S.A. in 1945.

Behind the development in the pre-War era and the vigorous rehabilitation in 1945-46 was that great figure in air transport—Dr. Albert Plesman, who founded K.L.M. and held the reins until his death in December, 1953.

For the rest, K.L.M.'s history can best be seen in the form of a diary of the 1919-1946 period and with some of the highlights of 1947-1959, which will be found on the next two pages.

After the arrival of the first K.L.M. service (with a chartered D.H.16) from London to Schiphol, Amsterdam, on May 17, 1920. On the left is Albert Plesman.

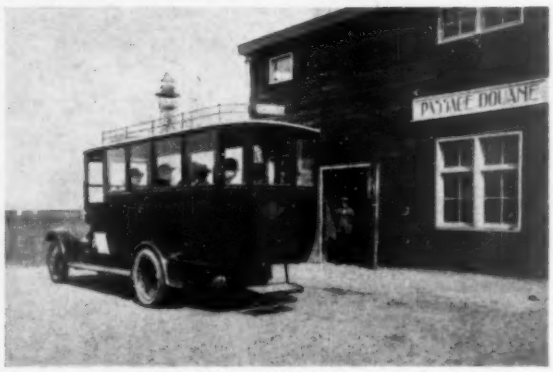
K.L.M.'s FORTY YEARS

The Oldest Airline . . . .

1919—Oct. 7.—Koninklijke Luchtvaart Maatschappij N.V. formed as a private limited liability stock corporation. Albert Plesman appointed manager.
1920—May 17.—London-Amsterdam (Schiphol) service started with D.H.16 (G-EALU) chartered from Aircraft Transport and Travel. Two passengers and newspapers. Pilot, H. "Jerry" Shaw.
May 29.—First charter flight.
July 5.—First airmail flight.
Sept. 1.—Amsterdam - Bremen - Hamburg service started with chartered aircraft.
1921—April 14.—Reopening of air transport "season." K.L.M. now have own aircraft (two D.H.9s and two Fokker F-2s) and pilots (G. J. Geysendorffer and P. Hofstra).

The 1921 five-passenger Fokker F-3.

May 9.—First air booking office opened in Amsterdam.
Aug. 25.—First airport hotel and restaurant opened at Schiphol.
Nov. 21.—Aerial Survey Department (now K.L.M.-Aerocarto) established.
1922—June 1.—Amsterdam-Brussels service started.
1923—June 4.—Amsterdam-Paris service started.
1924—Fokker F.7 (Rolls-Royce Eagle) in service.
1925—April 20.—Amsterdam - Copenhagen service started.
Fokker F-7A (Gnôme et Rhône (Bristol) Jupiter), eight passengers, in service.
1927—May 2.—Amsterdam - Basle service started.
June 15-July 24.—First intercontinental charter flight, Amsterdam-Djakarta return, in 27 days elapsed and 183 hr. flying. Fokker F-7A, Capt. Geysendorffer, two crew; passenger Van Lear Black.
Fokker F-8 (two Jupiters), 15 passengers, in service.
1928—April 23.—Amsterdam-Zurich service started.
Oct. 11.—Departure of first trial flight Amsterdam-Djakarta. Fokker F-7B (three Gnôme et Rhône Titans); Capt. I. W. Smirnoff, First Officer, I. A. Aler (now president of K.L.M.) and flight engineer. Dec. 11.—Departure of second Djakarta flight. Fokker F-7B, Capt. G. M. H. Frijns.
1929—Sept. 12.—Start of fortnightly Amsterdam-Djakarta service via (traffic stops) Nuremberg, Budapest, Istanbul, Baghdad, Karachi, Calcutta and Bangkok. First service by Fokker F-7B; Capt. I. W. Smirnoff. Scheduled elapsed time, 12 days; flying time, 89 hr.
1930—Fokker F-9 (three Jupiters), 18-20 passengers, in service.
1931—Fokker F-12 (three Pratt & Whitney Wasps), 16 passengers, and F-7A freighter in service.
Oct. 1.—Amsterdam - Djakarta service frequency now weekly; journey time reduced with F-12s to 10 days and flying time to 81 hr.
1932—Fokker F-18 (three Wasps), 12 passengers, in service.



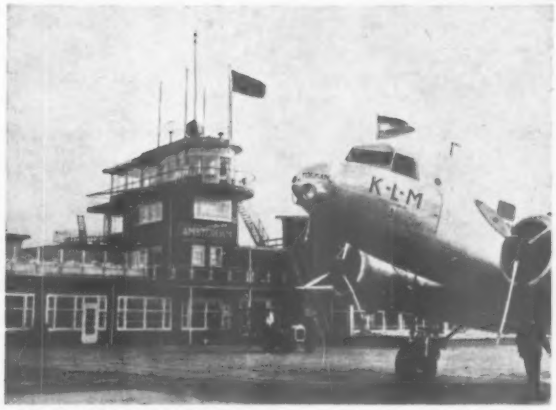
The first K.L.M. bus arrives at the terminal building of Waalhaven aerodrome, Rotterdam.

The "flight deck" of the F-7.

Below are two aircraft types used in the 1927-35 era—the handsome twin-engined F-8 (left), with nose freight compartment, and tri-motor F-18 (right). The F-18 is "Snip," seen arriving at Curacao after its Atlantic crossing in 1934.

1933—Sept. 15.—First airline medical service instituted.
Dec. 1.—Departure Europe/Asia charter with F-12. 21,900 miles flown Dec. 1-April 10.
Dec. 18-30.—Record return flight Amsterdam-Djakarta in F-18 "Pelikaan," Capt. I. W. Smirnoff. 17,650 miles; travel time, 201 hr.; flying time, 160 hr. 20 min.
Fokker F-20 (three Wright Cyclones), 12 passengers, in service.
1934—Oct. 20-24.—Douglas DC-2, PH-AJU "Uiver," second in speed and first in handicap section MacRobertson race, Mildenhall - Melbourne (12,350 miles). Capt. K. D. Parmentier and Capt. J. J. Moll. Journey time, 90 hr. 17 min.; flying time, 71 hr. 28 min.
Dec. 15-22.—First K.L.M. Atlantic flight (Amsterdam-Paramaribo-Curacao, 6,515 miles). Fokker F-18, PH-AIS "Snip," Capt. J. J. Hondong. Journey time, 8 days; flying time, 54 hr. 27 min.
Douglas DC-2 (two Wright Cyclones), 14 passengers, and Koolhoven FK-48 (two D.H. Gipsy), 6 passengers, in service. K.L.M. first European operator of DC-2.
1935—Jan. 19.—Curacao - Aruba service started with F-18.
June 12.—Amsterdam-Djakarta frequency increased to twice weekly. DC-2 reduces journey time to 6 days and flying time to 57 hr.
Fokker F-22 (four P. and W. Wasps), 22 passengers, and F-36 (four Wright Cyclones), 32 passengers, in service.
1936—July 1.—Curacao-Maracaibo (Venezuela) service opened.
Douglas DC-3 (two Wright Cyclones), 21 passengers, in service.
1937—Jan. 19.—Curacao-Caracas (Venezuela) service opened.
Oct. 2.—Amsterdam-Djakarta frequency increased to thrice-weekly.
DC-3 reduces flying time to 55 hr.
1938—May 16.—Curacao - Barranquilla (Colombia) service opened.
Sept. 5.—Curacao-Bonaire (Netherlands Antilles) service opened.
Dec. 6-31.—First K.L.M. flight Amsterdam-South Africa. DC-3, PH-ALR "Reiger," Capt. J. B. Scholte.
Lockheed 14 (two Wright Cyclones), 10 passengers, in service.

Schiphol Airport, Amsterdam, as it is to-day, 40 years after it first became K.L.M.'s main base. It had to be completely rebuilt after the War.



One of the Douglas DC-2s on the apron at Schiphol *circa* 1934. K.L.M. was the first European airline to operate this advanced new type; DC-3s were brought into service in 1936.

1939—Feb. 6.—Curacao-Port of Spain (Trinidad) service started.
Sept. 1.—War-time measures initiated. Djakarta service based on Naples.
Sept. 4.—Curacao-Paramaribo (Surinam) service opened.
1940—May 13.—Management of international services transferred to K.N.I.L.M. (Royal Netherlands Indies Airlines).
August.—Bristol-Lisbon service opened for B.O.A.C.
Douglas DC-5 (two Wright Cyclones), 18-22 passengers, in service with K.N.I.L.M.
1941—Aug. 19.—Curacao-Kingston (Jamaica) service started.
1942—Feb.—Djakarta service suspended.
1943—Jan. 11.—Curacao-Ciudad Trujillo (Dominica) service started.
Aug. 17.—Curacao-Port au Prince (Haiti)-Miami service started.
Sept. 8.—K.L.M. international management transferred to London.
1944—July 27.—Curacao-St. Maarten (Leeward Is.) service started.
1945—Nov. 28.—Amsterdam-Djakarta service reopened with DC-4s on twice-weekly frequency. Journey time, 5 days; flying time, 45 hr.
Dec. 17.—Reopening of first service in European network.
Douglas DC-4 (four P. and W.R. 2800s), 28-36 passengers, in service.
1946—Feb. 14.—First of series of flights to Paramaribo and Curacao.
Feb. 25.—First of series of flights to New York.
April 1.—Albert Plesman appointed president.
May 21.—Twice-weekly Amsterdam-New York services started.
June 6.—Weekly Amsterdam-Curacao (via New York) services started.
Aug. 6.—First of series of flights to South America.
Oct. 6.—First of series of flights to South Africa.
Oct. 18.—Amsterdam-Rio de Janeiro trial service started (extended to Montevideo on Dec. 11).
Lockheed L-049s introduced.

The first Fokker transport with a retractable undercarriage—the F-20, introduced in 1933.

Highlights of 1947-59

1947—Mar. 26.—First trial service Amsterdam-Kano-Johannesburg.
May 31.—Twice-weekly Amsterdam-Rio-Montevideo service started.
Oct. 7.—Weekly Amsterdam-Johannesburg service started.
Lockheed L-749s introduced.
1948—Nov. 29.—Rio-Montevideo service extended to Buenos Aires.
Convair 240 and Douglas DC-6 introduced.
1949—Jan. 26-July 22.—Amsterdam-Djakarta services operated via Khartoum and Mauritius over Indian Ocean.
May 20.—Weekly Amsterdam - Lisbon - Paramaribo-Curacao services started with DC-6s.
May 29.—Twice-weekly Amsterdam-Montreal services started with L-749s.
1951—Dec. 4.—Weekly Amsterdam-Manila-Tokyo services started with L-749As.
Dec. 7.—Weekly Amsterdam-Biak-Sydney services started with L-749As.
1952—Oct. 27.—Weekly Amsterdam-Mexico City services started with DC-6s.
Nov. 6.—Buenos Aires service extended to Santiago de Chile with DC-6Bs.
1953—Oct. 8-10.—K.L.M. Douglas DC-6A wins first prize in handicap section of London-Christchurch (13,063 miles) race. Journey time, 49 hr. 57 min.; flying time, 47 hr. 42 min.; Capt. H. A. A. Kooper.
Dec. 31.—Death of Dr. Albert Plesman.
Convair 340, Douglas DC-6A and Lockheed L-1049C introduced.
1954—Jan.—Two Fokker F.27 Friendships ordered.
May 1.—Lt.-Gen. I. A. Aler appointed president.
1955—June.—Nine Vickers Viscount 803s ordered.
Nov. 16.—Eight Douglas DC-8s ordered.
1956—Mar. 8.—12 Lockheed L-188C Electras ordered.
1957—May 23.—K.L.M. shares listed on the Amsterdam and New York Stock Exchanges.
Sept. 3.—Weekly Amsterdam-Houston (Texas) services started with DC-7Cs.
Dec. 3.—Closing of Amsterdam-Djakarta service—which was opened on Sept. 12, 1923.
Douglas DC-7C and Vickers Viscount 803 in service.
1958—Sept. 13-20.—First K.L.M. flight via Arctic; Tokyo - Fairbanks - Anchorage-Stavanger-Amsterdam with DC-7C; Capt. A. K. Bosman.
Nov. 1.—Twice-weekly Arctic route service Amsterdam - Anchorage - Tokyo, started with DC-7Cs.
1959—July.—Four more DC-8s ordered, making 12 in all—5 with turbofan engines.

K.L.M. STATISTICS 1920-1958

	1920	1929	1939	1949	1958
Employees	12	345	1,940	13,670	17,000
Unduplicated route miles	574	10,500	17,400	70,385	168,000
Aircraft	4	20	45	78	(1959) 91
Total payload capacity (short tons)	1.44	22	91	387	(1959) 631
Average cruise speed (m.p.h.)	83	95	165	235	300
Revenue miles flown	50,950	1,234,000	5,878,000	19,554,513	43,250,000
Passengers carried	345	15,690	98,311	380,900	941,000
Passenger-miles	85,000	4,404,900	37,668,700	404,924,000	1,250,300,000
Freight and mail (short tons)	27.5	860	2,697	8,701	31,804
Freight and mail (ton-miles)	6,900	264,400	1,784,350	15,640,800	55,200,000
Total ton-miles, all traffic	15,000	701,400	5,576,200	60,500,000	182,200,000

Riding on Air—
Some Initial Impressions

By John Fricker

FARNBOROUGH gave many thousands of people the opportunity of seeing the revolutionary Hovercraft in action, and, in conjunction with our sectional drawing of the SR-N1, published in the pre-S.B.A.C. Display issue, of obtaining a clear idea of the principles on which this unique vehicle operates. Many pilots—myself included—have wondered, however, just what the Hovercraft is like to "fly," and, while at the moment it is not possible to gain first-hand experience of controlling this device, some preliminary impressions were gained from the right-hand seat during a recent demonstration.

As this was undertaken at an airfield (Lee-on-Solent, where most overland experience has been obtained), these brief notes must necessarily largely ignore marine operation of the Hovercraft, although this is of course of equal importance. A few details of overwater operation were supplied by Lt. Cdr. Peter Lamb, Saunders-Roe test pilot, who has been responsible for the Hovercraft flight trials programme. This is now nearing completion, the prototype having successfully explored nearly all the initial problems of the air-curtain concept, in about 65 hr. "flying."

Operating limits for the small Hovercraft prototype at sea have proved to be wave-heights of about 2 ft. and a 4 ft. 6 in. swell (between trough and crest), the essential conditions depending on length rather than height. The Hovercraft will apparently ride a long swell with a ship-like motion, but shorter swells may necessitate reducing speed to avoid wave impact.

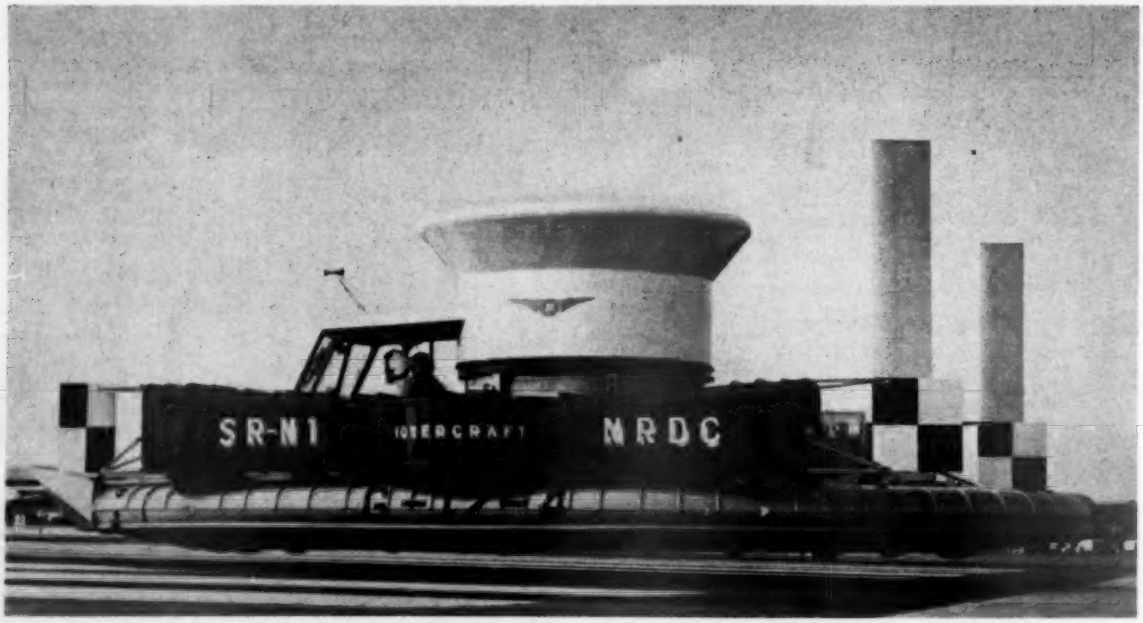
Like all marine craft, the SR-N1 has a "hump" or planing speed, below which acceleration is initially slow. The air curtain forms a marked depression in the water, with a high wave drag which decreases as speed is increased. The Hovercraft reaches its hump speed at 13-14 knots, when the depression is left behind, and subsequent acceleration is much more rapid. A slight pitch change accompanies the clearance of this hump speed, as in any planing craft, after which the Hovercraft is limited to a maximum still air speed of about 25 knots, through its profile drag and low propulsive thrust.

The latter is obtained by bleeding off 30% of the relatively low-pressure air produced by the four-bladed wooden fan directly driven by the 435 b.h.p. Alvis Leonides helicopter engine. This means that lift control is a direct function of engine r.p.m., and it is impossible with the prototype Hovercraft to vary the power distribution between lift and propulsion.

After this preliminary briefing, I climbed over the flat decking of the Hovercraft, into the right-hand seat alongside Cdr. Lamb. In addition to an apparently conventional aircraft stick and rudder bar, the "pilot" is provided with a second lever, surmounted by a helicopter-type twist-grip throttle, between the two seats. Although sometimes designated as a secondary control lever, the right-hand stick seems more important than the central column, in controlling both horizontal motion and speed.

Right, from the observer's seat, the author watches the progress of the Hovercraft as it "flies" along with a load of external passengers. Below, the SR-N1 well clear of the runway while making an impressive initial public appearance at Farnborough.

Photographs copyright "The Aeroplane and Astronautics"



Above, 20 fully equipped Marines dropped the hover height of the SR-N1 by only 4 inches. This view also shows the ditching bow and ventral landing pads.

Above, this view of the SR-N1 cockpit shows the simple instrumentation and control layout.

In its neutral position, it leaves the two gate-type valves in each of the long propulsion ducts half-open, so that air flows out both fore and aft, giving zero thrust. Pushed forward, the lever closes the forward gates and opens the rear valves, resulting in appropriate horizontal motion, while rearward movement reverses the effect. The lever has a large range of travel, facilitating precise selection of speed.

At each end of the propulsion ducts are rudder surfaces, actuated by the cockpit pedals, for directional control. When the Hovercraft is travelling full ahead, these are extremely effective, even without their vertical extensions, which were designed to provide additional fin area to balance the side area of the cabin. On reversing thrust to stop, however, directional control rapidly decreases, and the tail of the Hovercraft tends to swing round to one side or the other.

The technique is apparently to let this happen, so that the heading of the Hovercraft changes through 180 degrees, and it slides astern for a time with full forward propulsion. Loss of directional control is similarly experienced when hovering downwind, so that this manœuvre is either avoided, or limited to breezes of less than 5 knots. Light or zero winds are required at all times, at the moment, for Hovercraft operations. During its initial trials, the Hovercraft had "elevons" at each end of its propulsion ducts, but these were removed as being ineffective.

What little control is required in pitch or roll attitude is provided by the central stick, which controls spoilers to interrupt the airflow to four sections of the air curtain. The stick is centred by springs, which made it, I found on trying, very heavy to move, but it is not brought in for much use, other than as a trimming device, and the stability of the Hovercraft on its air curtain is so pronounced that it can be left alone for most of the time.

Being a research vehicle, the Hovercraft has few refinements, and I found that the noise of the Leonides, after starting, made further attempts at conversation, even on R/T, largely pointless. Apart from the engine test instruments, and tachometer, which is the key gauge, the simple cockpit panel contains only one other instrument of much significance. This is a sensitive A.S.I., actuated from a venturi head above the cabin, and graduated from 5-40 knots. There is also a gauge for the 27-gal. tank.

After a brief warm-up, Cdr. Lamb twisted open the throttle of the Hovercraft, which unstuck smoothly and evenly at about 2,400 r.p.m., and rose almost imperceptibly as power was increased. At 2,700 r.p.m. with the normal gross weight of 8,200 lb. (crew of two), the hover height is 7-8-in., while at max. continuous power of 2,900 r.p.m., which is normally employed, it becomes about 10-11 in. Apart from some dust blown in from the runway, there is little to indicate that one is sitting on an air cushion clear of the ground. On moving forward, the lack of vibration and smooth progress of the rock-steady vehicle is uniquely agreeable.

It was obvious from watching Cdr. Lamb that the movement of the vital right-hand lever was largely anticipatory, but it was an odd feeling sliding sideways and then backwards over the runway with full forward propulsion for perhaps 2-300 yards during a turn after a "high-speed" run. This was at 15-20 knots A.S.I., but felt much faster, because of the close and blurred proximity of the runway. I gathered that on the sea, there is less tendency to skid sideways on turns, because of the "keel" effect of the water depression.

Several turns were made "hands-off" the central stick, which was, however, pressed firmly forward on occasions to aid acceleration. The resultant pitch change seemed negligible. Turns on the spot seemed delightfully simple, as did sideways flight, accompanied by a cloud of dust through the cabin.

One of the most impressive tricks in the Hovercraft's repertoire is "ditching" from speed, which has been done in a calm sea from 45 knots simply by closing the throttle. The craft then planes on the water like a skimming stone on coming to rest but a ship-type bow was found necessary to prevent the stern wave from pooping the SR-N1.

The Hovercraft can also be landed from slow forward flight by more gentle closing of the throttle on the ground, which it contacts with its multiple stainless-steel pads, but like most aircraft, it should not touch-down with drift on. An emergency stop in this case is, therefore, fairly simple, but how, one wonders, are brakes to be applied to the air-cushion cars with which we are threatened by the Americans?

The Fighting Services

F.E.A.F. Promotion

AIR MARSHAL THE EARL OF BANDON, K.B.E., C.B., C.V.O., D.S.O., Commander-in-Chief, Far East Air Force, has been promoted to the rank of Air Chief Marshal. Appointed to his present post in July, 1957, he was previously C.-in-C., 2nd Tactical Air Force in Germany. Before going to 2nd T.A.F. in October, 1953, he was A.O.C., No. 11 Group.

R.A.A.F. Command Structure Changes

CHANGES in the command structure of the R.A.A.F. are in progress which will reduce the number of commands from three to two—one dealing with operations and the other providing all the required support. The Headquarters of the present Training Command and Maintenance Command are being amalgamated to form the new Support Command, which will be accommodated as far as possible in the Victoria Barracks area of Melbourne being vacated by the Australian Department of Air. Home Command, with Headquarters at Perth, N.S.W., is being renamed Operational Command.

Operational Command will be responsible for organizing and administering the operations of the Service in Australia and its territories, and the new Support Command will provide all requirements of training, equipment and maintenance. With the movement of the Department of Air from Melbourne to Canberra some of the present activities of the department will be transferred to the Support Command.

The new Support Command will be headed by Air Vice-Marshal A. L. Walters, C.B., C.B.E., A.F.C., who is at present Air Member for Personnel. Air Vice-Marshal W. L. Hely, C.B.E., A.F.C., Head of the Australian Joint Services Staff in Washington, will return to Australia early next year to become Air Member for Personnel. Air Vice-Marshal I. D. McLachlan, C.B.E., D.F.C., A.O.C., Training Command, will become Deputy Chief of the Air Staff, and Air Cdre. D. A. J. Creal, O.B.E., at present A.O.C., Maintenance Command, will become Senior Maintenance Staff Officer of Support Command.

The Last Flypast

WHEN the Spitfire 16 (SL 574) piloted by Air Vice-Marshal H. J. Maguire force-landed on a South London cricket field less than 10 minutes after flying over Horse Guards Parade during last month's Battle of Britain fly-past, the secret of the pilot's identity was broken for the first and last time. Normally, the Spitfire and Hurricane that have taken part in this annual ceremony have been flown by anonymous former Battle of Britain pilots, usually from the staff of Headquarters, No. 11 Group, Fighter Command. But it is understood there is no hard and fast rule on the selection.

Having taken off from Martlesham Heath, the base of the Battle of Britain Memorial Flight, Air Vice-Marshal Maguire followed the Hurricane in the fly-past and flew over the saluting base at approximately 500 ft. Near Crystal Palace, at an altitude of 1,600 ft., the engine suddenly cut and the fighter started to descend at more than 500 ft./min., leaving little time to find a suitable field for a forced landing. Having selected the Oxo sports ground, Air Vice-Marshal Maguire made a good wheels-up landing and stopped within about 200 yd. The cause of the engine failure—a 1,720 h.p. Packard Merlin 266 with only around 100 hr. operation—was still being investigated at the time of writing.

Presumably, although the Air Ministry had announced before the flight the withdrawal of the Hurricane and Spitfire from Battle of Britain ceremonies and fly-pasts over large built-up areas, the Battle of Britain Memorial Flight will log a few hours flying each year. Its strength at present comprises the single Hurricane and three Spitfires, including the crashed aircraft. The Hurricane (LF 363), a 2c built in 1940-41, has a Merlin 20, and the Spitfires consist of two Mk. 16s and one Mk. 19, all manufactured around 1945.

Senior Air Staff Officer at Headquarters, No. 11 Group, at the time of the flight, Air Vice-Marshal Maguire is to become A.O.C., No. 13 Group, on November 9.

Service Photography

NOW in its 43rd year, the R.A.F. School of Photography is forming a small historical section and museum in preparation for its golden jubilee in 1967, and is collecting photographic equipment, pictures and memoirs concerning aerial photography in the early days and during both World Wars.

The School had its origin in the Army School of Ballooning, formed in 1912, when its Commandant, J. E. Capper, was initiating experiments in aerial photography. As early as September, 1914, squadrons—particularly No. 3—were making operational photographic sorties in France, and photographers were being trained in the United Kingdom. In January, 1915, Lt. J. T. C. Moore-Brabazon was placed in command of the Experimental Photographic Section, Southern Aircraft Reserve Depot, attached to No. 1 Wing, Royal Flying Corps, to investigate the best type of camera and the best organization for air photography. On January 1, 1917, the School of Photography came into being at Farnborough, Hampshire, as a training unit of the R.F.C. and was commanded by Lt. C. Porri.

So far the School has been able to obtain certain early gear for its museum, including some Williamson P.7, P.14 and P.18 plate-type oblique and vertical cameras such as were used in the R.E.8, Bristol Fighter, D.H.9A and other aircraft of the First World War. But what it specially wants are some written reminiscences from people concerned with early attempts at aerial photography, and some concrete evidence about the first activities, not merely before and during the First World War, but also, perhaps, in the American Civil War and the Boer War, when pictures were taken from balloons.

Moved from Farnborough in 1947 to make room for E.T.P.S., the School transferred to its present home at R.A.F. Wellesbourne, Mountford, Warwickshire.

INGPEN TROPHY.—This year's award for the best all-weather squadron in air-to-air gunnery has gone to No. 46 Squadron at R.A.F. Waterbeach. The team comprised, left to right, (standing) Flt. Lt. T. Carter, Sgt. A. Ogden, Flt. Lt. D. Dawes and Flt. Sgt. P. Winslade, (seated) Flt. Lt. G. Jarvis, Wg. Cdr. F. Sowrey, A.F.C. (C.O.), and Flt. Lt. G. Bradshaw.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. F. D. S. Scott-Malden, D.S.O., D.F.C., to the Department of the Chief of the Air Staff; Wg. Cdr. A. N. Davis, D.S.O., D.F.C., to the Department of the Chief of the Air Staff, with acting rank of Gp. Capt.

Bomber Command: Gp. Capt. L. H. Trent, V.C., D.F.C., to R.A.F. Wittering to command.

Fighter Command: Gp. Capt. R. B. Morison, D.F.C., A.F.C., to Headquarters, for planning duties; Wg. Cdr. R. W. Williams to Headquarters.

Maintenance Command: Gp. Capt. L. H. Greenman to No. 30 Maintenance Unit, R.A.F. Sealand, to command.

R.A.F. Germany: Gp. Capt. R. G. Knott, D.S.O., D.F.C., A.F.C., to R.A.F. Gutersloh to command; Gp. Capt. R. Jones to Headquarters as Command Provost Marshal; Wg. Cdr. A. D. Boyle, to Headquarters, for planning duties.

Other Appointments: Gp. Capt. H. B. Verity, D.S.O., D.F.C., to Ministry of Defence as Secretary of the Joint Planning Staff; Gp. Capt. I. J. Lightfoot, to Ministry of Supply.

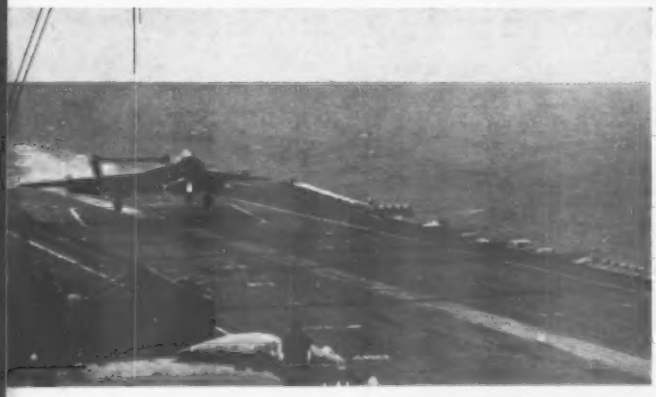
Notes and Events

Marine Craft Trophy.—The Marine Craft Squadron at R.A.F. Seletar, Singapore, has been awarded the Far East Marine Craft Trophy for general efficiency in 1959. It is competed for by marine craft units F.E.A.F. based in Singapore, Hong Kong, Gan (Maldive Islands), Penang and Katunayake (Ceylon).

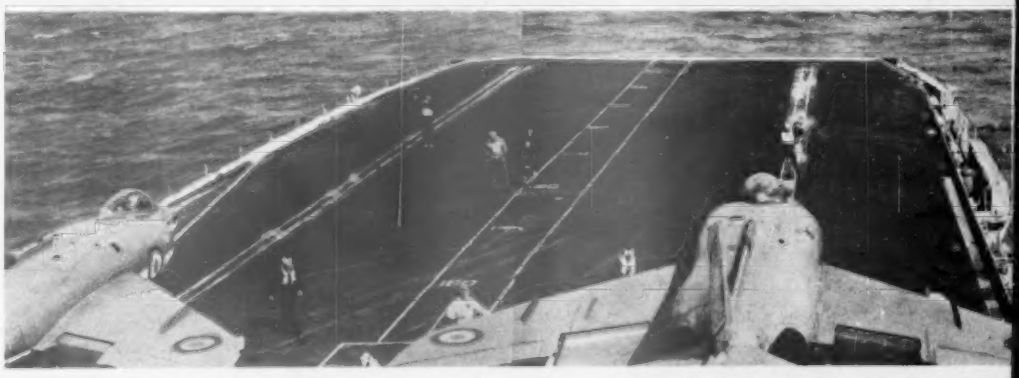
A.T.C. Reunion.—No. 11F (Brooklands) Squadron, A.T.C., is holding an all-ranks reunion on October 29, to celebrate the 21st anniversary of formation, and is anxious to contact ex-personnel, particularly pre-1947 types. For further information write to the C.O., Flt. Lt. M. W. B. May, Ashburton House, Send, Woking, Surrey.

Aboard "Victorious"

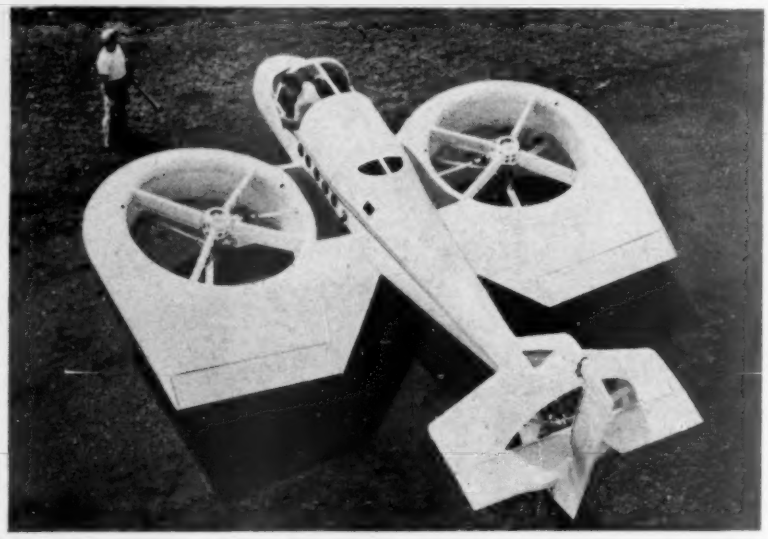
Photographs copyright
"The Aeroplane and Astronautics"



These photographs, taken during a recent day's visit to H.M.S. "Victorious" (Capt. H. R. B. Janvrin, D.S.C., R.N.) illustrate some of the activities that take place aboard the flagship of the Aircraft Carrier Squadron. Below, Sea Venoms of Nos. 893 and 831 Sqn., Scimitars of No. 803 Sqn., and Sky Raiders of No. 849B Flight being prepared for take-off. Above, a Sea Vixen FAW.1 of No. 892 Sqn., Yeovilton, making a touch-and-go landing and, right, the 10-sec. launching sequence of two Scimitars from the carrier's steam catapults



Ducted Fan VTOL



FIRST ground runs of the Vanguard 2C Omniplane were made on August 21. Following 10-12 hours of tied-down tests this novel test-bed aircraft will be taken to the Ames full-scale wind-tunnel, where NASA will sponsor 2-4 months of testing of the aircraft with U.S.A.F. support.

This interesting VTOL craft has been developed by the Vanguard Air and Marine Corp. of Radnor, Pennsylvania—a company formed comparatively recently. The president and vice-president are Edward G. Vanderlip and John J. Schneider respectively, who have had considerable rotorcraft experience in particular with the Piasecki Helicopter Corp.

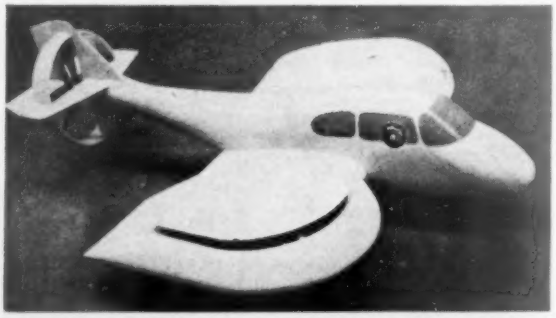
The Omniplane has shrouded rotors in its wing and a shrouded pusher-propeller at its tail. In forward flight the wing rotors will be stopped and the wing ducts closed by plate-type covers on the upper surface and Venetian blind covers on the lower surface.

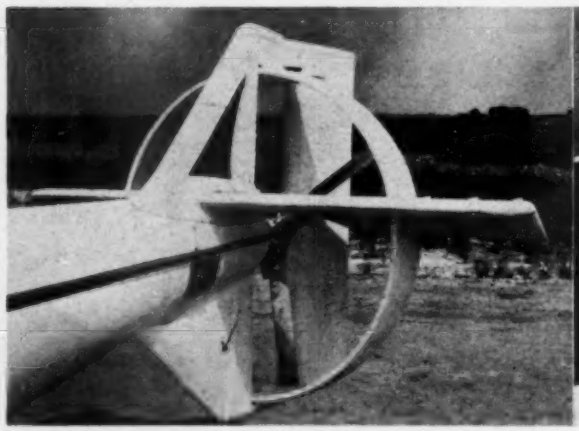
Cockpit controls comprise a cyclic stick, a collective-pitch lever with throttle twist-grip, and rudder pedals. Pitch of the tail propeller is controlled by a switch on the cyclic stick. For longitudinal control the cyclic stick varies the elevator angle; for roll control this stick operates the ailerons and gives differential changes in the collective pitch of the main rotors.

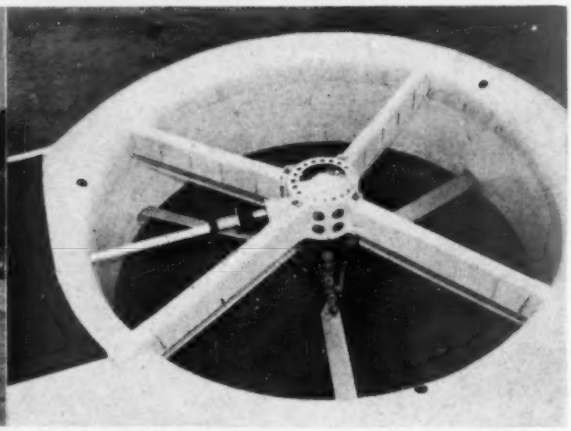
For vertical take-off the engine is started with the main rotors declutched and the tail propeller in low pitch. The wing ducts are then uncovered, the clutch engaged and main-rotor collective pitch increased so that the vehicle hovers. After a vertical ascent, the pitch of the tail propeller is increased to give forward movement. As transitional speed is reached collective pitch of the main rotors is decreased and the wing ducts are covered again, making an oddly shaped third wing. The main rotors are then declutched and operation as a conventional aircraft follows.

The Vanguard 2C embodies the rotors, transmission and clutch of the Jacobs 104 convertiplane project and much of its airframe comes from an Ercoupe light aircraft. Its power-plant, a 265-b.h.p. Lycoming O-540-A1A, is behind the cockpit.

A complete family of "fan-in-wing" aircraft has been studied by the Vanguard Corp. The Model 8, for example, is a four-seat executive aircraft with a 520-b.h.p. Lycoming engine. Weighing 3,400 lb., it would cruise at 200 m.p.h. over 550 miles. Another project is the Model 18, a 30,000-lb. short-haul transport seating 36-40 people and powered by two Allison T.56 shaft turbines. Its cruising speed would be 275 m.p.h.







Howard Levy photographs

FULLY DUCTED.—The prototype Omniplane (top) does not yet have the wing-duct covers shown on the model (centre right). These plate-type covers are to be raised slightly above the wing for hovering flight—as shown on the starboard wing of the model—and will seal the duct in forward flight, as on the model's port wing. Venetian blind covers will seal the ducts under the wing. The ducted wing rotors (above right) provide all the aircraft's lift in hovering flight. Propulsive thrust is given by the ducted propeller (above left) which also maintains airflow over the rudder and elevators at all times so that they are effective during the hover.

AS A FULLY-INTEGRATED WEAPON...

Everything connected with the flying and the operating of the ENGLISH ELECTRIC Lightning was designed and developed as a co-ordinated system. The airframe, the engines, the radar equipment, the electronic aids, the armament, the fire control devices—all were planned from the start to make the Lightning safe for its pilot, and deadly for its target.

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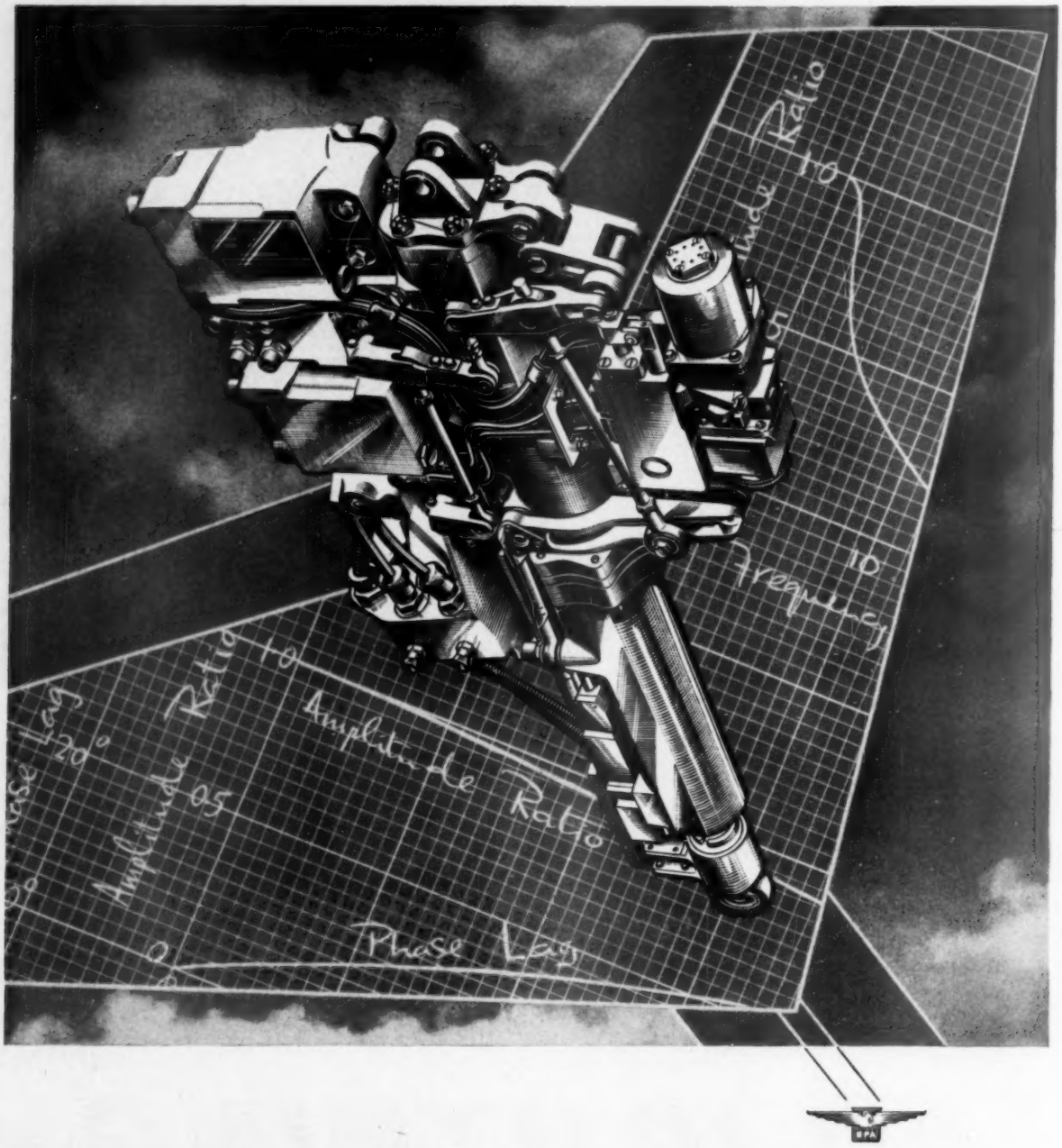


POWER CONTROLS

Boulton Paul powered flying control units incorporate rotary control valves, designed for sensitivity and accurate response. The tandem ram unit illustrated actuates the Blackburn NA.39 all-moving tail plane and operates in manual control, with or without auto-stabilization, or under complete auto-pilot authority.

BOULTON PAUL AIRCRAFT LTD.

WOLVERHAMPTON, ENGLAND

Missiles and Astronautics

Blue Steel Development

Later Stand-off Bomb will have Longer Range

SUPERSONIC jet bombers will find it increasingly difficult in future to reach targets protected by surface-to-air missiles and by all-weather fighters with missile armament. To maintain the deterrent value of strategic bombers and to keep them one jump ahead of the defences a range of air-to-surface missiles has been developed by the U.S., Britain and, no doubt, by Russia. Ideally these ASMs—or "stand-off bombs," as they are called in this country—should have sufficient range for bombers to release them outside the effective radius of defensive fighters and missiles, and should fly sufficiently fast and high to make their interception very difficult.

Britain's ASM is the Avro stand-off bomb, which has been code-named Blue Steel. Little information about it has been available until recently, but an assessment of its potentialities can now be made. This is the supersonic vehicle which will be carried by Mk. 2 versions of the Victor and Vulcan.

Flight Trials

This missile has been developed by the Avro Weapons Research Division which was formed in 1954. Full-scale test vehicles are now being tested in Australia. About 35 ft. long, they are of canard layout with a small delta foreplane and a delta wing with a span of about 16 ft. The only flight controls are the all-moving foreplane and inboard ailerons on the wing; the missile is manœuvred on the "twist-and-steer" principle. It has fixed delta fins above and below its body.

These test vehicles are powered by a de Havilland Double Spectre rocket motor with a maximum thrust of 16,000 lb. This HTP/kerosene rocket motor consists of a fixed-thrust Spectre, giving 8,000 lb. of thrust, mounted above a second variable-thrust Spectre which can be throttled from 8,000 lb. right down to 800 lb. of thrust.

After the missile is released from its carrier aircraft the lower Spectre is fired first; this can be done at any thrust setting in its operating range. The upper boost engine is then fired. This motor is probably only used at the beginning of the missile's flight to accelerate it up to the cruise Mach number, after which the motor is shut down.

Thereafter the variable-thrust motor takes over propulsion of the vehicle, which may well fly under a cruise-climb technique, climbing as propellents are consumed with its engine thrust being decreased progressively to maintain cruise speed. If this technique were used the missile could climb steadily to 70,000 ft. or more after being launched at 50,000 ft.

If thrust were increased at the end of the propulsion phase Blue Steel could accelerate and climb even higher before diving onto its target. But throughout its trajectory the missile is always within the atmosphere and under aerodynamic control.

Blue Steel is guided by an inertial navigation system developed by Elliotts which controls the missile in conjunction with an autopilot. Such a guidance system is immune to enemy countermeasures because it is completely self-contained within the missile and computes position by the integration of missile accelerations. But with an inertial system missile-position errors can vary with the cube of time and highly accurate and expensive gyros and accelerometers are necessary if guidance accuracy is to be adequate for the missile's nuclear warhead to obliterate the target. The accuracy of Blue Steel's inertial guidance is unknown, but the accuracies of such systems were indicated in a recent lecture on inertial navigation. This stated that using a three-gyro system with a wander rate of 0.1° per hour the position error after a 15-minute flight at 600 kt. would be 630 yd.

It seems likely that a flight-programming device also forms part of the missile's control system. This could be pre-set to make the missile fly one of many different trajectories to its target and approach it from any chosen direction. Such a system would allow the missile to be used in a range of ways and would complicate the task of the defence greatly.

For example, if an ASM had a speed of Mach 2 and a range of 200 miles, it could strike any target within an area of 125,000 sq. miles in less than 15 minutes after being launched. This is an area greater than that of the United Kingdom.

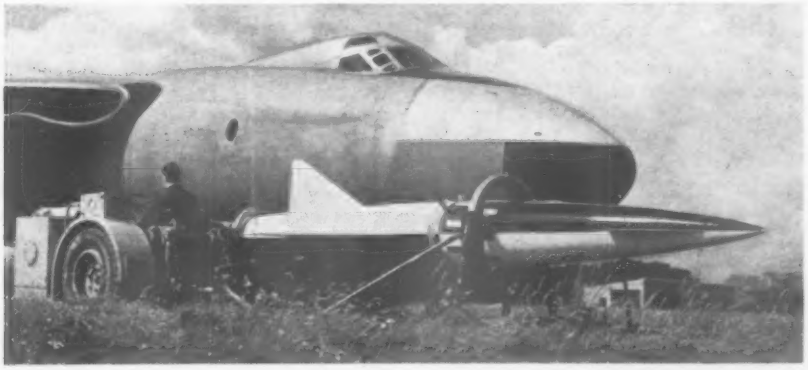
The canard delta configuration was chosen for Blue Steel because it gives reduced trim drag when cruising and allows a simple control system and a good internal layout for equipment. Aerodynamically and structurally Blue Steel is more akin to an aircraft than to a missile because it does not have to manœuvre sharply towards the end of its flight. Its structure is similar to that of an aircraft but kinetic heating effects have been allowed for in the design.

Aberporth Tests

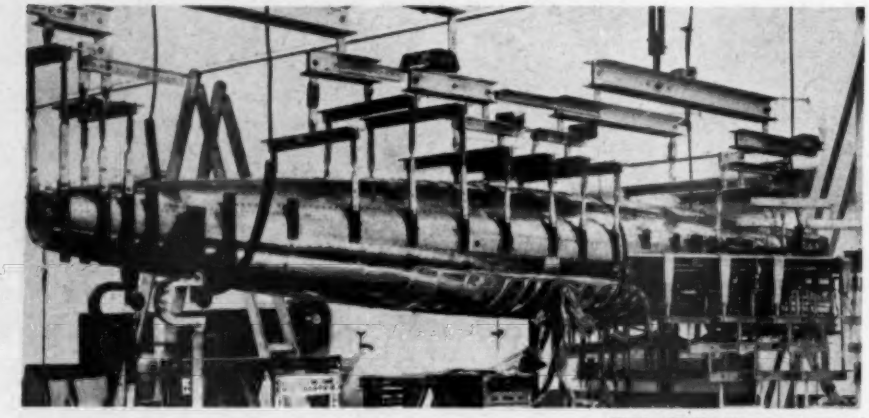
Much experimental information was needed when the project was begun and studies of aerodynamics, kinetic heating, propulsion, fuel systems and automatic control were made. Aerodynamic information was given by free-flight rocket-boosted models which were launched at Aberporth. This programme was supplemented by supersonic wind-tunnel tests at the R.A.E., the Aircraft Research Association and at Avro's.

To study autopilot behaviour large-scale flying models of Blue Steel were built and launched from Valiant bombers both in Britain and Australia. These vehicles had a representative structure but used solid-propellent rocket motors. Information on accelerations, temperatures, pressures and control movements was telemetered from the vehicles.

At the same time as these trials studies were made of servo



MINIATURE MISSILE. — Scale models of Blue Steel—apparently about one-third full size—have been test-launched from Valiant bombers both in Britain and Australia.



STRUCTURAL TEST—Loading tests have been made on the wing and body of a full-scale Blue Steel (left).

CHECK-OUT—This scale model of Blue Steel (below) is undergoing electronic checks in the trials preparation laboratory before it is launched from a Valiant bomber.

mechanism functioning and automatic control as well as structural tests and rig tests of systems.

No official figure has been given for Blue Steel's design range, but unofficial estimates go as high as 500 miles. This appears somewhat optimistic for the missile in its present form; it is difficult to see how this rocket-propelled vehicle can have a range substantially greater than 200 miles. Even 200 miles is a considerable advance on the range of the U.S. Rascal ASM, which is reported to be about 75 miles, although the missile is not a great deal smaller than Blue Steel.

In the U.S. the rocket-propelled Rascal has been replaced by the turbojet Hound Dog, which has a range of about 350 miles. A similar trend is possible in Britain; although rocket-propelled ASMs can operate at high speeds, their range is limited. A good range is more necessary than sheer speed, as it is essential to keep the bomber out of reach of defensive missiles and fighters before launching its missile. If Blue Steel has a range of about 200 miles, it must be inadequate in this respect.

Sir Roy Dobson has said that a later mark of stand-off bomb being developed at Avro will have far greater range and penetration. This suggests that Britain may be following the U.S. trend and developing a turbojet-propelled ASM. If this is so, a possible powerplant could be the de Havilland Gyron Junior DGJ.10, which will power the Bristol 188 supersonic research aircraft. A turbojet powerplant of this type has a specific fuel consumption lower by far than a rocket motor; ranges approaching 1,000 miles at speeds above Mach 2 are not beyond the bounds of possibility for supersonic missiles so powered.—J.R.C.

Radiation Spotting in Space

GENERAL agreement was reached at a conference in Geneva this summer, between British, United States and Russian delegates on a plan, originally proposed by the Soviet Union, for the setting up of a system of artificial satellites to detect nuclear tests in space. The recommendations had been worked out by scientists representing the three Powers as a step towards control of nuclear arms.

It was suggested that five or six Earth satellites might be established at altitudes of more than 30,000 km. (18,640 miles). If this was not feasible for economic or technical reasons, it was suggested that six to 10 satellites appropriately placed in near-circular orbits at altitudes of from 500 to 700 km. would ensure complete surveillance of the space around the Earth, except in limited and predictable regions, below an altitude of about 2,000 km. Alternatively, two to four satellites at a similar height would ensure complete surveillance, except in limited or predictable regions, below an altitude of about 10,000 km.

It was further recommended that a satellite should be placed in an appropriate elliptical orbit round the Earth to provide maximum coverage of the region in the Earth's magnetic field in which electron trapping occurs. It is of interest to point out that when the Americans carried out their nuclear test explosions in space under Project Argus in August and September last year, the satellite Explorer IV was used to measure this radiation.

If it is thought desirable to extend the range of surveillance, to provide increased coverage of the regions beyond the Moon and the Sun away from the Earth and to make nuclear testing in space more difficult by increasing the weight of shielding necessary for concealment, a system of four satellites should be placed in appropriate solar orbits, of radii approximating that of the Earth round the Sun, when the state of technology permits.

Each satellite should carry instrumentation to achieve the maximum reliablity and range of detection of nuclear explosions in space and carry apparatus to check the performance of the satellite. All required data should be transmitted to a suitable number of control posts. Equipment should be installed in these control posts to ensure the rapid and reliable analysis of the signals received from the satellites.

The advantages of the system were two-fold. By an effective monitoring of all regions of the Earth outward into interplanetary space, the possibility of adding to the World's levels of radio-activity should be eliminated. It would also lead to the three nuclear Powers co-operating in the common task of putting Earth satellites into orbit for peaceful purposes which as Mr. Ormsby-Gore, Britain's chief delegate at the conference, later remarked, could have important repercussions in other spheres of international life.

The report is being referred to the British, American and Russian Governments. It is hoped that the recommendations can be incorporated into a comprehensive treaty leading to an effective ban on nuclear tests.

Thoughts after the Tenth I.A.F. Congress

IF one compares the papers presented at the Tenth International Astronautical Federation Congress with those at the ninth, there is a sense of anti-climax. In order to get the right perspective it is necessary to go back to 1951, when a very sound and ingenious idea was evolved in the B.I.S. It was suggested that the achievement of space flight might be advanced a great many years if it were decided to launch miniature satellites by means of chemical rockets, using techniques developed for World War II missiles.

This idea was taken up enthusiastically in the United States and in due course came to fruition in the Vanguard project. Meanwhile, however, Russia had developed a new family of larger missiles and was able to launch satellites which seemed to be needlessly massive and hastily contrived, in comparison with the Vanguard satellite. More attention evidently had been given to perfecting a powerful launching vehicle, presumably a chemical step-rocket.

Thus we find ourselves in a world where the United States and Russia are competing for the fantastically expensive objective of launching man-size satellites with expendable chemical step-rockets of piled-up complexity. Since the main reason for this kind of expenditure is the development of the launching vehicles for military purposes, the future of astronautics may be rosy only in inverse ratio to the future of World peace.

It would have been healthier for astronautics to have continued with the relatively modest programme of miniature satellites inaugurated in connection with the I.G.Y., until nuclear propulsion was available for use in single-phase recoverable launching vehicles. Perhaps, therefore, the papers dealing with nuclear fission rockets (O. H. Wyatt at the Symposium, G. Leitmann, P. Perrier and J. J. Newgard at the Congress) were the most important practical contributions to space flight at the Tenth Congress.

But there is a lot more than this in the future of astronautics. In a paper at the Ninth Congress, Dr. von Kármán said: "The most important task is at present to work on the reduction of the weight of devices which produce electric power. This task is more important than the dreaming up of new and ingenious propulsion schemes."

This refers, of course, to electric power on a very big scale, such as can be expected only from controlled nuclear fusion, and a great opportunity has been lost by the complete neglect of this vital subject at the Tenth Congress. Even descriptions of abortive experiments such as ZETA would have been extremely encouraging. Such developments are part of the new science of "magnetohydrodynamics," usually abbreviated to MHD. This combines the techniques of electro-dynamics and fluid mechanics, so that an ionized gas can be made to behave like the moving element in an electrical machine, at the same time propagating the initial magnetic field to greater distances.

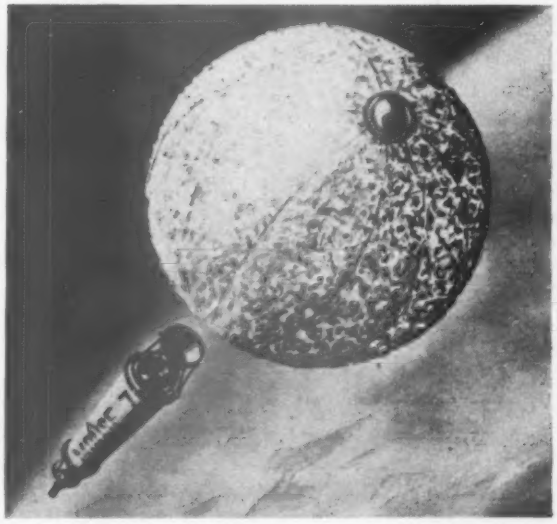
Getting Out of the Steam-engine Phase

We shall remain in the "steam-engine" phase of astronautics until a wide range of MHD techniques can be applied, particularly electric generation in thousands of megawatts and direct magnetic propulsion in the ionized interplanetary gas.

One of the 10th Congress papers (by A. R. Kantrowitz) drew special attention to these two régimes of MHD, and showed that interplanetary space is, in fact, occupied by an ionized gas which is highly susceptible to MHD influences. It can be acted upon at very long range so that, in spite of its very low density, a sufficient total mass can be involved to produce the milli-*g* reactions which are adequate for the orbit changes of interplanetary travel. Moreover, a large part of the solar system can be regarded as being immersed in the Sun's atmosphere of ionized particles, some of which is trapped by the Earth's magnetic field in a gigantic MHD régime.

Although the Earth's atmosphere at low altitudes is not ionized, it can be ionized locally and temporarily by means of existing techniques, thus making it also a suitable medium for MHD processes. For example, radio waves of extremely high frequency, ultra-violet radiation or a very high temperature can produce ionization.

The last could be useful in allowing MHD protection against aerodynamic heating, but the first is the most promising for general purposes, given a great deal of development. Thus the air in the vicinity of an aircraft, approximating to that which would be influenced by wings or rotors, could instead be ionized transiently and moved in a MHD set-up, for lift or propulsion. In this way aircraft will become a sub-class of spaceships, greatly benefiting thereby in convenience of operation and silence.



Artist's impression of the B.I.S. "minimum satellite" proposal of 1951, showing the final stage rocket and inflatable foil satellite.

Meanwhile, the merging of aircraft and spaceship design techniques can proceed if the expendable rocket with its brief thrust-life is discarded in favour of the ram-jet propelled hypersonic aircraft. This was suggested in the discussion at the High Altitude and Satellite Rocket Symposium of 1957 (W. F. Hilton).

Besides using such an aircraft for a large part at least of the task of launching many satellites, it could itself fly at orbital velocity and zero lift in the upper atmosphere, as suggested as long ago as the 5th I.A.F. Congress (by K. A. Ehricke). Moreover, if it had a good duration and payload, it would be more valuable for military purposes than a simple satellite, since it could change its orbit at will and be rearmed periodically.

If this sort of duration is beyond the reach of chemically powered ram-jets, we could look to some form of nuclear heat source. The high temperatures involved, however, would seem to eliminate all forms of fission reactors at present envisaged.

The structural design of spaceships seems to be a relatively neglected subject, but it is a significant fact that design studies of the type of aircraft suggested above always indicate low wing loadings and generally low density structures. Thus the vast amount of work done on thin sheet metal structures for aircraft probably will not be wasted after all.

There will be, however, at least one new factor to complicate the techniques which have been evolved for aircraft. It is pretty certain that electric capacitors occupying very large volumes will be required in connection with the generation of electric power from nuclear fusion. This is due to the fact that the magnetic containment of the nuclear fusion reaction will be modified by the release of nuclear energy, and a pulsating arrangement of this process is the obvious way of tapping off electric power. Therefore, a probable development will be the use of the thin sheet metal required for the capacitors, as part of the structure of the spaceship, perhaps combining structural bonding with electrical insulation.

Evidently we ought to be looking forward to an even more highly developed and proliferating industry than that which we know as aeronautics. Apart from the desirability of maintaining the kind of research, development and engineering that has largely depended in the past on military needs, the time may not be far distant when there will be something like a panic urgency for emigration to other planets. This involves

a great deal more even than the problems of space flight itself, but none of it can be shirked.

We must be prepared to carry out on other worlds the sort of engineering that is needed to make Antarctica and the Sahara fertile, and more besides, such as modifying a planet's entire atmosphere. Finally, there is the problem of logistics in the vast migration which will fan out from Earth to Mars and Venus, from Mars and Venus to other planets and giant moons in the solar system, and eventually to the planets of other stars. Aeronautics has just about reached that stage of achievement when it can be called the embryo of this future industry, its personnel having completed their apprenticeship.

R. C. ABELL.

Von Braun Speaks Out

SOME forthright comments were made by Dr. Wernher von Braun, technical director of the Army Ballistic Missile Agency, Huntsville, Alabama, following the success of the Russians in impacting the Moon. The Soviet Union, he said, was far ahead of the United States in space projects "and there is no amount of money which can buy back lost time."

He added that he was convinced that if Russia stopped immediately the U.S. could catch up with them in one, two, or three years. "We have the brains, the resources, the capability, but we are hampered by continuous evaluations, justifications and rejustifications instead of progressing in our development of space projects," he said. He thought the United States needed to spend twice its present budget on space research and blamed "red tape," lack of funds and complacency for the fact that America was lagging behind.

Dr. von Braun felt, however, that the United States might be on a par with Russia in the development of ballistic missiles, particularly the ICBM. But, he said, he had been "alarmed all along" about Soviet progress in space projects and had not been surprised when the Russians hit the Moon with Lunik II.

The U.S. Saturn rocket, with eight times the thrust of the Jupiter or Thor, could deliver a very heavy payload to the Moon, but the first Saturn shot might be three years away. "It is definitely possible that Russia will have advanced beyond the Saturn capabilities by the time we are ready," he said. "I am quite sure that when our young astronauts blast off into space they will meet Russian Customs officers."

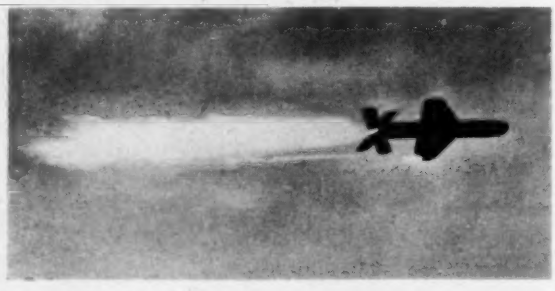
Army Missile Suppliers

WITH the recent announcement of its new tactical missile English Electric Aviation has consolidated its position as the main supplier of missiles for the British Army. The Thunderbird SAM which the company has developed is replacing the Army's heavy anti-aircraft guns and English Electric's new tactical missile will replace the U.S. Corporal.

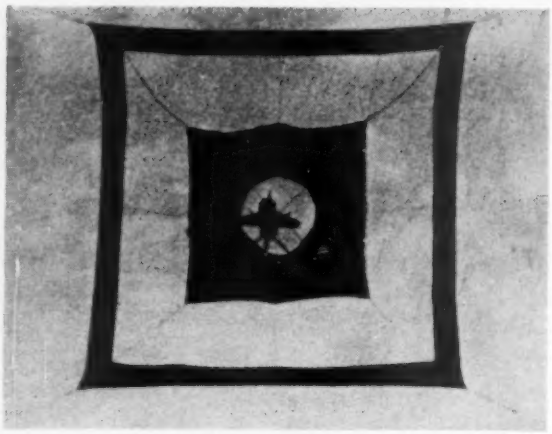
Only for its smaller missiles has the Army looked to other companies. For anti-tank duties it will have the Australian Malkara as well as a missile under development by Fairey Aviation; to replace its short-range anti-aircraft guns it may purchase the Short Tigercat, a land-based version of the Seacat which is being developed for the Royal Navy.

Malkara "On Target"

TARGET accuracy of a high order has been demonstrated by the Australian Malkara anti-tank missile which has been ordered by the Ministry of Supply in substantial numbers. Produced at the Australian Commonwealth Government Aircraft Factory in Melbourne, Malkara is a short-range, wire-controlled, line-of-sight missile capable of destroying heavy tanks; it can also deal effectively with fortifications.



Malkara, which is wire-guided, just after launching.



Malkara scores a "bull" on a stationary target at Woomera.

The 6-ft. missile employs solid propellent, weighs about 200 lb. and has an effective range of about 3,500 yd. Its outstanding accuracy can be gauged from the accompanying picture showing the weapon passing through a hole in a canvas target not much greater than its own wing span.

A number of missiles can be carried in a scout car or a light tracked vehicle. Signals directing the Malkara are transmitted via the control wires by means of a simple thumb-stick.

Organizing the I.A.F. Congress

THE significant proceedings of the 10th I.A.F. Congress should not be allowed to pass without due tribute being paid to the men and women of the British Interplanetary Society who were responsible for its organization.

The B.I.S. Council had worked for the best part of a year in preparing for the event which eventually drew more than 300 of the World's rocket and astronautical scientists to our shores. The work included soliciting over 80 technical papers, arranging for preprinting and translation, preparing information bulletins keeping prospective delegates informed of arrangements, planning various receptions and functions, including an astronautics exhibition, and at the time of the Congress itself, registering the participants and dealing with queries in English, French, German and Russian.

Simultaneous lecture sessions were run at Church House as well as business sessions, and a Space Law Colloquium, held at Lincoln's Inn, drew the presence of lawyers and jurists of international repute, including representatives of the U.S. Senate.

Undoubtedly, a large part of the credit for the success of the I.A.F. Congress is due to Mr. L. J. Carter, the energetic Secretary of the B.I.S., whose enthusiasm welded the Society's "task force" into a most efficient team. Col. John P. Stapp (of rocket test-sled fame), president of the American Rocket Society, in a tribute to the efficient running of the Congress, said he was impressed by the sheer enthusiasm that existed in the B.I.S. which, in many cases, had led to members giving up their annual holidays to serve as officials. It is certain, too, that many dipped heavily into their own pockets.

It might be pointed out that the same British group was responsible for the planning and organization of the Commonwealth Spaceflight Symposium, held at Church House during the three days prior to the I.A.F. Congress.

The Society has recorded its gratitude for help received over the conference period to the Hawker Siddeley Group, Air BP, and the AVCO Manufacturing Company.

A Loss to Polish Astronautics

AN atmosphere of sadness was cast upon the final proceedings of the I.A.F. Congress when Professor K. Zarankiewitcz, vice-president of the Polish Astronautical Society, collapsed and died while addressing delegates at Church House on September 5.

A regular participant in I.A.F. affairs, Professor Zarankiewitcz, aged 56, was himself a vice-chairman of the Federation. He was Professor of Mechanics at Warsaw Technical University, Dean of the Civil Engineering Faculty, and a member of the astronautical studies committee of the Polish Academy of Sciences. He leaves a widow in Poland but no children.

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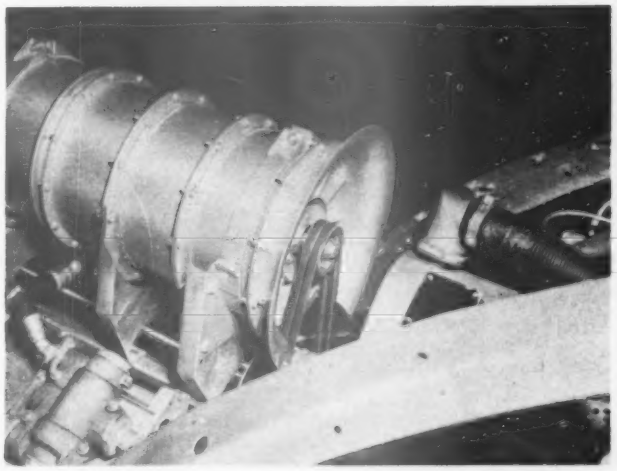

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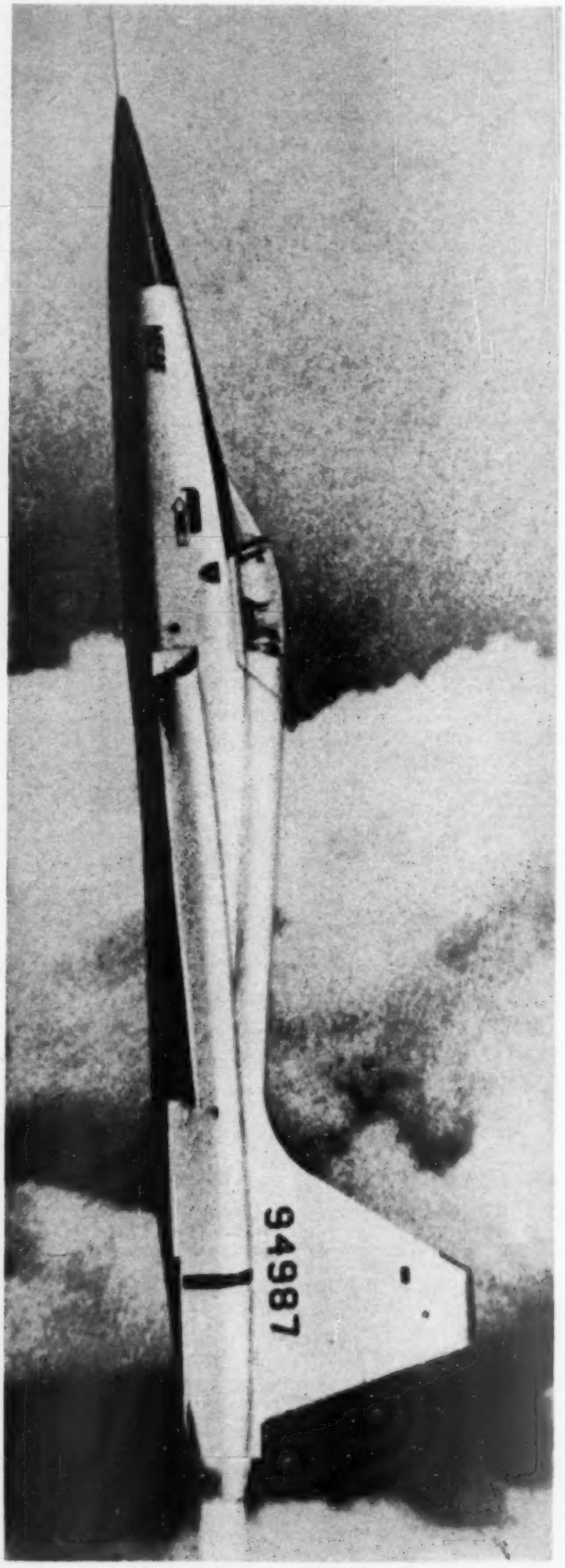
Northrop's N-156F is the first airplane U.S.-designed specifically for defense needs of the other Free World nations. The Freedom Fighter takes advantage of new jet engines, new lightweight materials, new design technology that no other fighter yet reflects. With its multi-purpose mission capability, performance, and ease of operation, the N-156F can virtually double a nation's effective fighting force.

This is because the Freedom Fighter is lighter, smaller, and easier to operate. Light, simple design cuts procurement costs, results in fuel savings and ease of maintenance. The Freedom Fighter cuts by approximately 50% the need for heavy, costly ground support and rare skills.

This highly reliable airplane can take off any time – almost anywhere – scant seconds from the scene of possible air or ground combat. This mobility contributes to quicker reactions. It keeps more aircraft battle-ready along a wider and more dispersed perimeter for maximum striking power – with minimum vulnerability. As a multi-purpose fighter, the N-156F flies air-to-air, air-to-ground, and low-altitude strike and reconnaissance missions.

No weapon system today matches the Freedom Fighter's advantages. It costs less to buy, to fly and to maintain. And because the N-156F is designed for production outside the United States, this new fighter will contribute to the economies of the countries it will defend.

Test pilots use the word "clean" to describe the N-156F's performance. Their reports praise its low- and high-speed flight handling characteristics. They find the new fighter meets and exceeds all the performance indicated and assured by extensive wind tunnel tests. They appreciate its twin-jet safety – its all-weather dependability.



NORTHROP INTERNATIONAL

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Astronautics and Missile News

AIRBORNE IRBM.—An attempt by the U.S.A.F. to launch a ballistic missile—presumably an early test vehicle for the Douglas XGAM-87A—from a bomber in flight over the Florida Atlantic range was called off because of "technical difficulties," it was reported on September 25.

U.S.A.F.'s SPACE ROLE.—The U.S.A.F. will in future be the only Service concerned with "all space transport and all space vehicle rocket boosters," the U.S. Defense Department announced on September 23. Existing vehicle projects of the Army and Navy will be taken over by the Air Force, including the ARPA Saturn space booster being developed by the Army Ballistic Missile Agency at Huntsville. The Advanced Research Projects Agency will suspend all further space activities but will continue to conduct advanced research in other fields such as anti-missile defence.

SPACE BUBBLE.—Boeing have revealed the design for a manned space-vehicle which, they say, could be built in orbit inside a plastic bubble; having controlled atmosphere and pressure, the bubble would permit technicians to work without space-suits. Nylon nets would divide the vehicle into seven levels.

ALBM NOSE-CONE.—The Missile and Space Division of General Electric is to produce the nose cone for the XGAM-87A air-launched ballistic missile under development by Douglas.

U.S. SPACE SET-BACKS.—The Atlas-Able moon-probe due to be launched towards the moon early this month exploded during a static firing at Cape Canaveral on September 24. As a result NASA is to re-examine the entire space-probe programme. Dr. Hugh Dryden, of NASA, has said that the U.S. would not hit the moon with a rocket for at least two years because of inadequate propulsion.

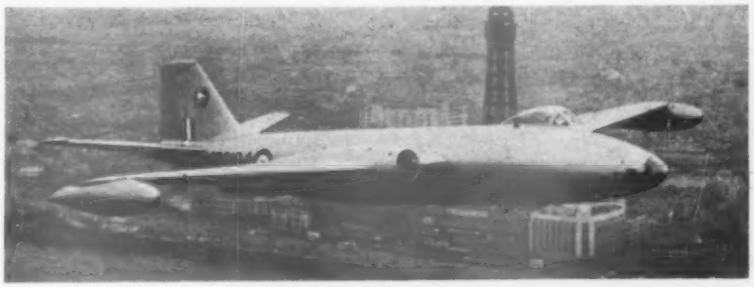
General Aviation News

SHOWING THE ARGOSY.—On October 6 an Armstrong Whitworth Argosy sets out from Elmdon Airport, Birmingham, on the first of two European trips which form the first phase of a World-wide series of tours planned for the aircraft. The first trip will take it to Copenhagen, Stockholm and Oslo. On October 14 the aircraft will once again leave Elmdon, this time for Paris, Zurich and Rotterdam. Prior to these trips, each of which will take four to five days, an Argosy was to fly to the Isle of Man.

GREATEST CIVIL THRUST.—A guaranteed minimum thrust of 20,250 lb. per engine will be provided for the Vickers V.C.10 jet transport by the Rolls-Royce Conway RCo.42 Mk. 540. No other civil turbojet engine has yet been announced which gives so great a thrust.

EXPORT RECORD.—British aircraft industry's exports in August had a value of £12,171,098, bringing the total for eight months of 1959 to a record £111,644,249 (5% better than the same period of 1958). India and Switzerland continue to head the export lists, thanks largely to the continuing deliveries of Hunters and Canberras to India and Hunters to Switzerland.

AIRBORNE DINERS.—Aviation Forum, whose members are mainly aviation journalists and publicists, held their annual dinner on Sept. 19 in an Eagle Airways 100-seater DC-6C. The party comprised 85 members and guests, who included Mr. Geoffrey Hall, chairman and managing director of Fairey Aviation, Wg. Cdr. F. W. Hilton, Blackbushe Airport Commandant, and Mr. Harold Bamberg, chairman and managing director of Eagle Aviation.



NEW FOR N.Z.—The first of 13 Canberras for No. 14 Squadron, R.N.Z.A.F., was handed over at Warton on September 17. It is a B(I)12, similar to the R.A.F.'s B(I)8 intruder.

VERTOL FIRST.—The Vertol YHC-1A tandem rotor helicopter for the U.S. Army made its first flight in September. Powered by two T58 turboshaft engines, the YHC-1A is similar to the Vertol 107 recently demonstrated in London.

INERTIAL NAVIGATION. — The Sperry Gyroscope Co., of New York, has received a $142 million U.S.A.F. contract for the production of inertial bombing-navigation systems and ground support equipment for the S.A.C. wing of 36 B-58 Hustlers. The airborne system cost per bomber is nearly $2.9 million.

BELGIAN DOVES.—Force Publique, the security force of the Belgian Congo, has ordered two Doves to add to the existing fleet of eight Doves and a Heron.

DRONE STRATOJETS. — The U.S.A.F. has awarded Lockheed's Georgia Division a $5 million contract to convert 12 B-47 Stratojets into QB-47 pilotless drone aircraft for use in the evaluation of the North American defence systems. Two QB-47s produced under an earlier development contract are now being flight tested at Eglin A.F.B.

AERO GOLF.—The Aero Golfing Society played their annual match against the Royal Aircraft Establishment at Farnham Golf Club on September 18. The result was a win for the A.G.S. by 7½ matches to 5½ matches.

Commercial Aviation Affairs

SABENA 707 PLANS.—Sabena will introduce Boeing 707s on its Brussels-New York service four times a week from February 15, 1960, and on the same date will inaugurate weekly services to Leopoldville via Rome and to Montreal.

TRAFFIC ESTIMATE. — The M.T.C.A estimates that U.K. airlines traffic on scheduled and inclusive tour services in July was 16% above the level in July, 1958. Capacity operated was 12% higher and the overall load factor rose from 63% to 65%.

CAMBRIAN PROGRESS. — On November 1, Cambrian Airways will reopen its Bristol-Cardiff-Manchester service, suspended early this year. Next May, a direct service from Cardiff and Bristol to Belfast is also planned. Fares between Cardiff and Bristol, Manchester, Belfast, Glasgow, Edinburgh and Aberdeen are to be reduced by about 15% from November 1.

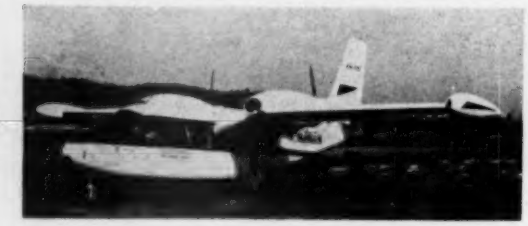
LATEST BOEING.—Newest airline livery seen on a Boeing 707 belongs to Air France, whose first 707-328 made its first flight in September. Named "Chateau de Versailles," this 707 is to be delivered to Paris early this month and the Air France 707s are expected in service between Paris and New York before the end of the year.

T.W.A. FREIGHTING.—On October 6, T.W.A. will introduce an all-freight service across the Atlantic, with two L-1049H Super Constellation flights a week between London and New York. Shipments will be accepted at T.W.A.'s cargo office at London Airport (North) up to 55 minutes before departure time.

MORE F-27s.—Aloha Airlines has ordered three more Fairchild F-27s for delivery in February, March and May. The airline has had three F-27s in service since June and reports a 25% increase in traffic.

PRAGUE EXPANSION. — A new terminal and new runways are to be built at Prague Airport, about ¼-mile from the existing airport at Ruzyn. Work on the new runways has begun, and the new buildings will be constructed in 1961.

PUNTA CAUCEDO. — The new Dominican airport at Punta Caucedo will open on October 24, after which date all international services will operate from it. Built at a cost of $17 million, it has a 6,600-ft. runway and a high-speed road link to the capital.



PIAGGIO EXPORT.—This Piaggio P.166 was recently flown from Italy to Australia for delivery to Papuan Air Transport Ltd. of Port Moresby. Patair propose to use it as a high-density 10-seater on feeder lines.

CONWAY PROVING.—On September 27 the first of the 15 Rolls-Royce Conway-powered Boeing 707-436s for B.O.A.C. made a non-stop flight from Seattle to Tokyo in 10 hr. 47 min. The average speed for the Great Circle distance of 4,790 st. miles was 445 m.p.h.

ACCRA IMPROVEMENTS. — Work should be almost completed on the new runway at Accra Airport, Ghana. This will be 9,600 ft. in length and will be parallel to the existing 03/21 runway, which will be extended and used as a main taxi-track when the new runway is finished shortly. A new terminal building is also to be constructed later.

MILLIONTH PASSENGER. — On September 18 Silver City flew its millionth vehicle-ferry passenger.

NOISE VIOLATIONS.—According to the Port of New York Authority, three airlines operating Boeing 707s at Idlewild infringed the noise regulations on 40.4, 36.7 and 14.6% of occasions respectively. The B.O.A.C. figure, using Comets, was 7.6%, or four out of 55 take-offs.

CARGO CONVERSIONS. — United Airlines has contracted with Douglas to convert six DC-7s into all-freight Cargoliners, with a 32,500-lb. payload. The company already has seven DC-6A Cargoliners.

DULLES INTERNATIONAL. — The new International airport which is being built at Chantry, between Washington and Baltimore, is to be named Dulles International Airport.

PRESTWICK CONTRACT.—Richard Costain, Ltd., has been awarded a £240,000 contract for the extension of the main runway at Prestwick. Work was to begin last week and be completed by June, 1960, and involves a 2,300 ft. extension to the runway and perimeter tracks.

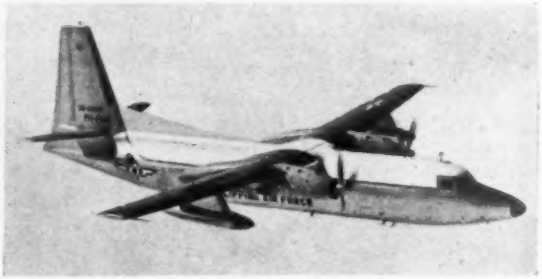
T.A.I. LOSS.—A DC-7 operated by Transports Aériens Intercontinentaux crashed immediately after taking off from Bordeaux-Merinac airport on September 24 during a flight from Paris to Abidjan. Of the 65 occupants, 53 were killed.

Military Aviation Affairs

U.S.A.F. ACCIDENTS.—Last year the U.S.A.F. major accident rate was reduced by 20.7% to an all-time low frequency of 10.4 accidents per 100,000 hr. flown. Maj.-Gen. J. D. Caldara, Director of Flight Safety Research, has said that runway arrester barriers could have prevented 82 major U.S.A.F. accidents.

R.A.F. DISPLAY.—Three Vulcans of No. 617 Sqn. Scampton, are to take part in the opening of Wellington Airport, New Zealand, on October 24. Transport Command will be represented by a Comet, Hastings, Britannia and a Beverley and the detachment will be under the command of Air Marshal Sir Denis Barnett, A.O.C.-in-C., Transport Command.

COMMONWEALTH DEFENCE. — The strength of the R.A.F. in Kenya is being increased by two additional squadrons—one Beverley and one Twin Pioneer. To be based at R.A.F. Eastleigh this autumn, the squadrons will transfer to the new Nairobi Airport, Embakasi, when certain necessary construction work is completed.



FOR THE PHILIPPINES. —This Fokker Friendship for the Philippine Air Force was flown to Manila last month. Fitted with long-range tanks and weather radar, it will be operated by the P.A.F. 206th Troop Carrier Sqn.

AIR DEFENCE CONTROL.—A universal air weapons control system made up of radar, communications and data processing equipment is being developed by U.S. General Electric for the United States Government. The new electronic system, known as the Air Weapons Control System 212L, will be capable of controlling a wide variety of weapons and will be designed for both fixed and mobile applications. It will be used primarily outside the United States, since the SAGE System is used for defence inside the country.

News About People

GROUP APPOINTMENT.—Air Marshal Sir Andrew McKee, K.C.B., C.B.E., D.S.O., D.F.C., A.F.C., until recently A.O.C.-in-C., Transport Command, has left London to take up an appointment as regional executive of the Hawker Siddeley Group, New Zealand and Fiji.

DOUGLAS SALES DIRECTOR.—Mr. J. R. McGowen has been appointed director of commercial sales of the Douglas Aircraft Company; at the same time he retains his responsibilities as DC-8 programme co-ordinator. He succeeds Mr. Nat Paschall, who has resigned for personal reasons but remains a member of the board and a consultant to the company.

PRIZES. — Flg. Off. F. Flood, commissioned in 1956 after 12 years as an air gunner, won every prize on his course at the A.N.S., Thorney Island. He will fly as navigator with Coastal Command.

PSYCHOLOGY APPOINTMENT.—Smiths Aircraft Instruments, Ltd., have appointed Dr. Norman Loveless, a lecturer in psychology at Queen's College, Dundee, to be a consultant. Dr. Loveless has for some time been engaged in research in the field of pilot response to instrument-presented information.

ROTARY DISTINCTION.—Honorary Membership of the Helicopter Association of G.B. (now merged with the R.Ae.S.) was bestowed recently upon Mr. Raoul Hafner, Lt.-Col. J. W. Richardson and Mr. Eric Mensforth.

AIRLINE APPOINTMENTS. — Mr. A. S. Linney, who has been with B.O.A.C. since 1957, has been appointed in charge of the Corporation's sales office in Cleveland. New B.W.I.A. appointments are of Mr. M. J. Martinez, formerly secretary of the Board, to be manager at Barbados and Mr. J. A. H. Kinch, the present manager at Barbados, to be sales manager for the Caribbean area.

WG. CDR. J. H. HEYWORTH.—We regret to record the death, on September 20, of Wing Commander J. H. Heyworth, A.F.C., chief test pilot of Rolls-Royce, Ltd., until May, 1954. He joined Rolls-Royce's test team in 1936 after serving a short commission in the R.A.F. Recalled to service on the outbreak of War, he flew in the Battle of Britain and commanded No. 79 Squadron before returning to Rolls-Royce as assistant chief test pilot in 1941. Ten years later he became chief test pilot, and in the course of his duties he flew almost every prototype fitted with R.-R. engines, including the earliest jet engines.

HOVERCRAFT APPOINTMENT.—Mr. L. A. Sweny, manager of Marconi's aeronautical division, has been seconded to Hovercraft Development, Ltd. His services on aeronautical matters will continue to be available to Marconi.

Personal Flying

John Fricker in the left-hand seat of the Aeromere Falco F.8L which, owned by J. Cosmelli, cruises at 185 m.p.h. on a 150 b.h.p. Lycoming. A flying assessment is to appear shortly.

Photograph copyright "The Aeroplane and Astronautics"

By the time this issue appears, the last aeroplane will finally have flown out of Croydon, whose historic turf is now to be submerged in South London's sprawling Subtopia. With its throttling ring of houses, to which it has finally succumbed, Croydon was not a particularly good airfield in the twilight of its career, but it was better than any possible alternative will be, for personal and business flying.

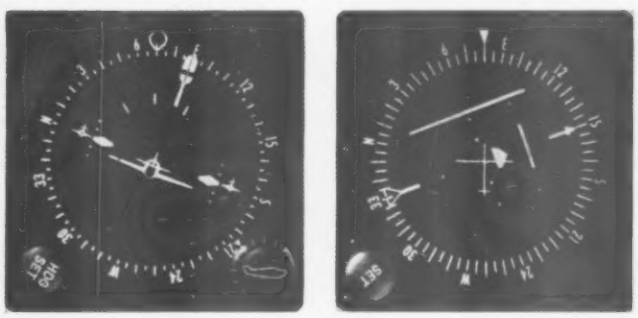
There was ample room for executive and charter aircraft up to Dakota size, and hangarage, servicing and administrative accommodation were equally adequate. All this has been ruthlessly sacrificed to some mythical god of progress, depriving London, in the process, of a Customs airport for non-scheduled operations within a radius of 30 miles.

It is easy enough, with a stroke of the pen, to destroy such facilities, in the face of opposition from all sides, but it is going to be considerably more difficult at some future date, to find sufficient space for an airfield suitable for executive flying requirements. The pressure for this will come, sooner or later. In the meantime, the loss of Croydon has set back the growth of personal flying in this country by several years. It is, perhaps, a fitting accompaniment to the exodus of the current Minister, who may have been interested in transport but was not very civil about this particular form of aviation.

• • •

Piper Aircraft Corporation has announced that its 1960 model Comanches will have a new cabin ventilation system, new reclining front seats and revised interior furnishings. The new ventilation system provides ten cool-air inlets, eight warm-air outlets and a defrosting system for both windscreen and forward side windows.

Deliveries of the 1960 250 b.h.p. Comanche will begin in November, with the new 180 b.h.p. model following two months later. Since production of the Comanche began eighteen months ago, some 1,500 have been produced. Of these, about two-thirds were the 250 b.h.p. version, with a useful load of 1,200 lb., while the remainder were 180 b.h.p. Comanches, carrying 1,075 lb. About 90% of all Comanches are equipped with the Piper AutoFlite single-axis automatic-pilot.



Presentation of the Lear L.I.F.E. system is by these two instruments. Left, is the NAFLI attitude director, which shows the aircraft in a descending right turn, with the Bank Index aligned on the Steering "Bug" to intercept a VOR/LOC course. The situation display right, shows the aircraft's proximity and heading in relation to ILS localizer and glide path.

U.K. agents for Piper Aircraft are Vigors Aviation, Ltd., of Kidlington, who demonstrated the Comanche and other aircraft of the Piper range at Fair Oaks last week-end. A flight assessment of the Comanche appeared in our issue of June 19.

• • •

Personal Plane Services, which are run by Douglas Bianchi at White Waltham, have been appointed agents for the products of Ets. Claude Rousseau of Dinard. They can supply to amateur constructors parts and components for the Emeraude, which the French company manufactures, at competitive prices. Complete Emeraudes of the latest type can also be supplied to customers' requirements, with rapid delivery.

The Emeraude is being manufactured under licence at Maidenhead by Garland-Bianchi Aircraft, as the Linnet, and the prototype has now qualified for a Type C. of A. The first production Linnet is due for delivery in the near future, and several have already been ordered.

• • •

An interesting sidelight on the safety of U.S. executive flying, which comprises more than half the total of aviation movements in America, is provided by recent C.A.B. accident statistics. These indicated that the passenger fatality rate per 100,000 averaged 1.12 for business flying, compared with 3.78 for scheduled services.

• • •

A demonstration which was of great significance to business flying operators, as well as to scheduled airlines, was recently given at Hatfield by the well-known American electronics engineer, Mr. William P. Lear. It was undertaken in conjunction with Pye Telecommunications, Ltd., using that company's ILS system installed at the de Havilland airfield, to show the automatic landing potentialities of the Lear Integrated Flight Equipment (L.I.F.E.), linked with the Lear L-5B auto-pilot.

The latter item is standard in a large number of business aircraft, being a compact precision unit developed in 1949, and it is also fitted to many public transport aircraft, including the Caravelles of Air France. When coupled with the L.I.F.E. command instrument system, which may be utilized as an independent flight reference layout, or combined with any auto-pilot, the L-5B provides complete push-button automatic flight control, and coupled approach facilities on ILS down to a height of 20 ft. above the runway threshold. This combined system is to be found in the Fairchild F-27 Friendship, the McDonnell 119 jet transport, and the Beech/Morane-Saulnier M.S.760 Paris executive jet.

For the demonstration, it was installed in Bill Lear's Beech E18S airborne-laboratory, N34L, which facilitated flight assessment of the combined system, after a discussion of its capabilities on the ground. The equipment was set out in working form on a bench, and comprised a complete simulator, on which a semi-automatic ILS approach could be flown, and a trace record subsequently examined. The ingenuity and miniaturization techniques applied by Lear to aircraft electronic equipment were aptly illustrated by the fact that this working transistorized simulator was comfortably accommodated in two small suitcases.

The L.I.F.E. part of the system comprises, for the pilot, two standard-size instrument dials in place of the normal gyro-horizon and gyro-compass. The upper dial is the NAFLI (Natural Flight) director, which is an integrated three-axis aircraft attitude indicator combining these functions with heading and glide-slope references. The lower dial is a situation display,

also based on a compass azimuth-ring, and providing a logical and orderly display of direction and relative aircraft position to VOR/LOC course and glide-slope.

On its own, L.I.F.E. is claimed to make IFR flight, and ILS approaches, considerably easier by computing all the variables, and presenting the pilot with simply interpreted instrument indications. In this form, the instruments and transistorized units cost, in the U.S., $8-9,000, and about 100 sets are in service with business operators. Coupled with the L-5B auto-pilot, the system as a whole costs about $17,000, and is claimed to open up airports otherwise closed to aircraft not so equipped, by reducing the acceptable weather minima.

Bill Lear quoted several examples of operations from various airports which were closed for normal services through fog and low ceiling. With the L.I.F.E./L-5B-equipped Twin-Beech, landings have been frequently made with zero ceilings and visibility of one-sixteenth of a mile. As the electronic system permits only minute deviations from the approach path, the corrections made by the equipment are negligible, the resultant rock-steady flight path making for good pilot tranquillity during the monitoring phase before the high-intensity threshold lights become visible.

A smooth approach down the glide-path under automatic conditions also demands a good straight beam, which is one of the main features of the Pye ILS equipment. This was apparent during the flight demonstration at Hatfield, when the Lear airborne equipment followed the localizer and glide-slope beams much more closely than could any human agency, in an automatic approach, compensating for a moderate cross-wind, and bringing the Twin-Beech to the precise centre of the runway threshold. The pilot, Bill Darling, let the aircraft continue to within a few feet of the ground, before taking over manual control.

The Pye ILS at Hatfield incorporates the latest modifications resulting from developments at the Blind Landing Experimental Unit at Bedford (which the Lear Beech subsequently visited). These include replacement of the dipole aerials by slot aerials on the glide-path to give glide-slope linearity virtually to ground level. Another change is improved monitoring and automatic control of the localizer beam to give indication of the runway centre on landing to plus or minus 20 ft. on a 6,000-ft. runway.

This is adequate for automatic landing without the use of leader cables, and this will be the next step in coupled-ILS approaches. The present break-off height of 20 ft. with the Lear equipment will be eliminated by the incorporation of redundancy and height-sensing systems, and development will include micro-miniaturization to facilitate the general adaptation of business and transport aircraft to automatic landing.

Even before this ultimate stage, however, the Lear L.I.F.E/L-5B equipment coupled with a good ILS beam can lower acceptable weather minima to 100 ft. ceiling and one-quarter mile visibility. Such a decrease would enable operators to improve schedule reliability by perhaps three or four times, and Air France are already reported to be requesting lower limits for their Lear-equipped Caravelles, with great competitive advantages.

VERY PERSONAL FLYING.—Bert Goodchild flying the single-seat ultra-light monoplane built by John Taylor in his dining room (THE AEROPLANE AND ASTRONAUTICS for December 5, 1958). This clean little design has completed its initial test programme at White Waltham. Wg. Cdr. "Tich" Holmes undertook the early flight trials.

Gliding Notes

by Dr. A. E. Slater

CROSS-COUNTRY news from Lasham in the last week or two starts with a 300-km. triangle in a Skylark3 by "Rocky" Stone (airline pilot, first name unknown), who never got above 3,500 ft., never climbed more than 900 ft. in any one thermal, and used 61 thermals. He could have done with a 62nd too, as he landed a few fields short of Lasham, having covered Gold "C" distance but missed a Diamond through not reaching the final goal.

Four days later, Ted Shephard, presumably in the Army Club's Olympia 419, made 300-km. Gold "C" distance along the unusual northerly course to Dishforth, in Yorkshire, using "dry" thermals all the way, as there was not a cloud in the sky. The only other reported flight of this kind was by Archie Erskine, who flew 300 km. from Dunstable to Roborough (Plymouth) in dry thermals on June 14; he believes this to be the first Gold "C" distance to be done in dry thermals alone, and would like to know if anyone else can claim priority.

On the last week-end of August at Lasham, a syndicate-owned Skylark3 distinguished itself with three consecutive long distances by its three owners: Rika Harwood flew it on the Saturday 150 miles to Roborough, where Roger Mann and Godfrey Lee landed from Dunstable at about the same time; Hugh Mettam flew it 166 miles from Lasham to Fowey on Sunday, and Brian Masters 140 miles to Crediton on Monday.

Dennis Burns, of R.A.E. Farnborough, who flew his Skylark3 100 miles to Dunkeswell (Exeter) on Saturday, was back in time to do a 300-km. dog-leg next day from Lasham eastwards to Lewes and then westwards to Exeter. Other flights on Saturday were 109 miles to Exeter by Peter Williams (Army), and Ray Brigden's completion of his Silver "C" after trying for 14 years, while from Andover Flt. Lt. Frank Allen made Gold "C" distance to Penzance, though it was not his goal. Sunday flights from Lasham included also 190 miles by George Burton to Perranporth, 137 by Ron Willbie to Princetown prison in time for tea, and 100 by Godfrey Harwood to Dunkeswell in his 12-metre Swallow.

* * *

WINNER of the Victor Boin International Trophy this year, it is just announced in the British Press, was David Ince, who flew 289 km. (180 miles) from Charleroi in Belgium to Emsdetten, north-east of Münster in Germany, in an Olympia 419. A. Xhaet of Belgium, in a Ka-6b, was runner-up with 276 km.

M. Victor Boin is chairman of the Royal Belgian Aero Club, and he instituted this Trophy a few years ago as a sort of "Gordon Bennett Cup" for gliders. His idea was that it should be a simple contest without complicated rules, and that competitors should be launched as closely together as possible.

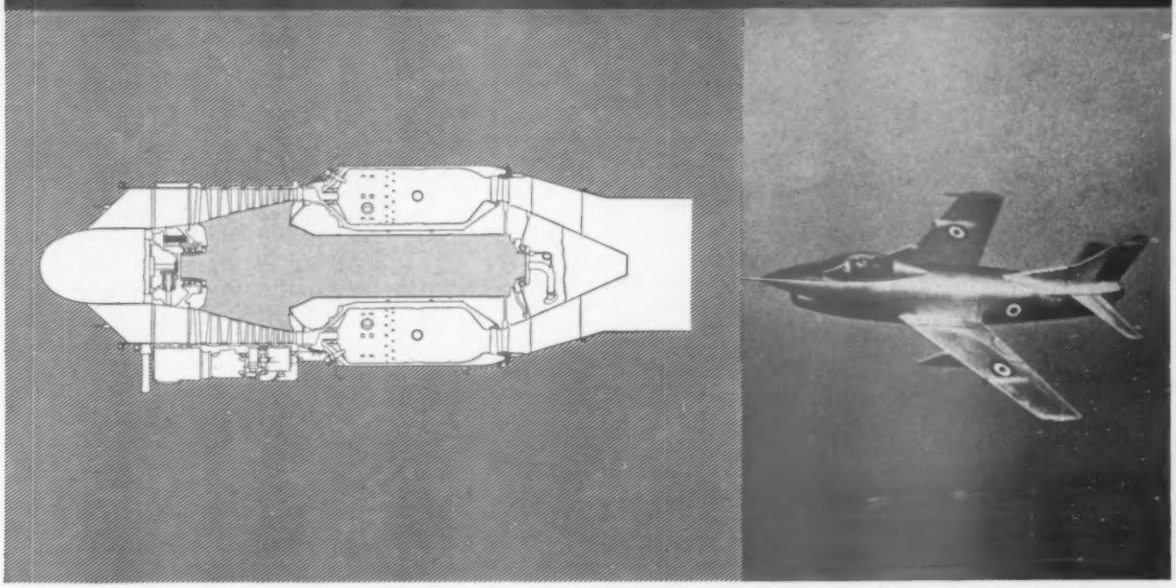
This time 29 sailplanes were launched between 11.00 and 12.00 hrs. on July 5, but even so there must have been a fair element of luck, as the distances covered varied from 289 to 28 km., and Paul Lepanse, a French pilot of international standing, managed only 76 km. in a Breguet 901. The 2nd to 9th places were taken by Belgians, and the 10th by J. H. van de Stegen of Holland, with just 200 km. in a Skylark 2. Three other Skylarks and a Prefect (which finished 24th, just after Lepanse) were entered by Dutch pilots.

* * *

AN entirely new sailplane of 15 metres span (49 ft. 2½ in.) is being designed for Elliotts of Newbury by their design consultants Aviation and Engineering Projects, Ltd. It is evidently not just another modification of the laminar-flow Olympia, as was the Olympia 415, which flew in the Standard Class in Poland last year, for this new design, we are told, "is involving a tremendous amount of design study, stress investigation, and development drawing, before the prototype can be constructed."

Naturally it is hoped that the prototype will be ready in time for next year's World Championships in Germany, and if David Ince is in the team he will be asked to fly it. The type will go into production for not more than £1.000 if the performance turns out to be as outstanding as the makers expect, and if it can be produced at that price. Finally, we are told, nothing more is to be divulged about the machine until it has been test-flown.

Orpheus turbojet - already flying in 6 different aircraft - now reaches 6,810 lb thrust dry, over 6:1 thrust/weight ratio . . .



ORPHEUS 803—general arrangement showing the two-bearing layout.

...ANOTHER ENGINEERING ADVANCE BY BRISTOL SIDDELEY

The design philosophy behind the Orpheus family of engines was based on two conflicting requirements—extremely light weight and exceptional reliability. That these requirements were successfully reconciled is shown by the fact that the Orpheus has been specified in five countries for no fewer than 14 distinct types of aircraft, six of which are already flying. The Orpheus is undoubtedly the most advanced medium-thrust turbojet engine in the world and the latest version, the B Or 12, has more than twice the thrust of the original Orpheus, which first flew in 1955.

The Bristol Siddeley Orpheus B Or 12, like the earlier versions, achieves its outstanding performance through basic simplicity of design. Producing 6,810 lb thrust dry (8,170 lb thrust with simplified reheat), for a weight of 1,110 lb, the B Or 12 has a very high thrust/weight ratio of over 6:1. This is combined with a good specific fuel consumption (0.933 lb/lb/hr at maximum continuous rpm, sea-level static conditions), very compact dimensions (81.4 in from intake flange to exhaust flange; 32.4 in diameter), and minimum servicing requirements.

Omnipresent Orpheus

The Orpheus family has a far wider range of applications than any other aero-engine in its class. The design has been proved by a remarkable record of trouble-free operation and various Orpheus versions power aircraft ranging from trainers and executive transports to research aircraft and lightweight strike fighters. The last category includes the Fiat G 91, NATO's standard strike fighter, powered by the Orpheus 803 (*shown above*).

The Orpheus is in production in India and Italy as well as Great Britain, and will shortly be built in Germany.

BRISTOL SIDDELEY ENGINES LIMITED

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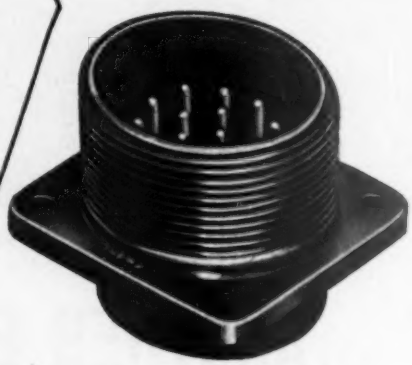
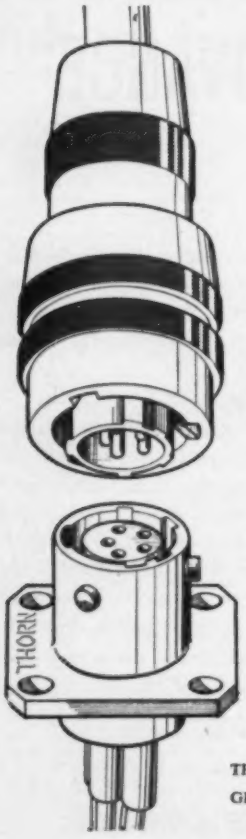
- *Maximum performance, minimum weight.*





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- *Three-point bayonet lock; perfect axial alignment of mating parts at all times.*
- *Five-key polarisation—positive protection against mis-mating or cross plugging.*
- *Miniaturised—light weight—compact.*

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Navaid from Canada

MANY of our readers are already aware of the large amount of development and evaluation of Doppler navigation equipment that has been undertaken by the Canadian Marconi Co. during recent years. Last autumn the company began actual production of an airborne system which has already been ordered in quantity by both airlines and specialized operators. Recently the Federal Aviation Agency approved the installations now in service in Pan Am's Boeing 707s. K.L.M. will shortly be receiving equipment for their Douglas DC-8s.

At the S.B.A.C. show last month, actual production units from the Canadian Marconi factory were displayed and created a considerable amount of interest—particularly as they were described as being straight off the production line and not given any particular show finish. In fact, the company proudly claimed their equipment to be the first airborne Doppler system in the World in production for airline use.

Briefly, the units themselves are built to conform to the ARINC* radar characteristic No. 540, which was produced as a general outline of the mutual requirements of the airline operators. On latest production equipment, the tracker unit will be in a ½ ATR case, while the transmitter/receiver, which can be mounted near the antenna, will be in a ¼ ATR case.

Five units comprise a complete sensor assembly, with an additional two, or optionally three units, if an electronic computer is used as well. The sensor units comprise a transmitter/receiver, tracker, control unit, antenna and indicator.

Externally the transmitter/receiver and tracker resemble almost any other airborne electronic units. The control unit is a very small panel fitted with control switches for "on" and "off," slewing and land and sea operations.

There are two forms of indicator presentation; one being a conventional circular dial with two needles—the first needle indicating ground speed and the second degrees of drift. The alternative indicator provides digital presentation of ground speed and a centre zero needle display of drift.

The antenna assembly comprises a transmitting element and a unique system for providing the four beams required to obtain both the ground speed and drift information. The method employed is to switch mechanically the receiving aerial with respect to two reflector assemblies. Movement details from the antenna are transmitted to the indicator by means of servo mechanisms.

The principles of Doppler navigation have been described and discussed too often already to warrant detail discussion here; essentially, the system is based on measuring the change of frequency of a signal between its transmission and reception and thus enabling a continuous and direct measurement of the movement of the antenna over the ground to be made. It is, however, worthy of mention that Canadian Marconi claim their equipment to be the first FM/CW (frequency modulated/constant wave) system built, and was largely the work of a team of engineers working under the direction of Mr. K. C. M. Glegg, the chief engineer of C.M.C.'s Commercial Products Division.

Salient features of the C.M.C. system are:—

(1) The system is based upon a new low-noise continuous wave technique developed some years ago which, for all practical purposes removes the operating restrictions hitherto experienced when using conventional CW systems; these are normally associated with transmitter noise and microphony problems. The C.M.C. method also surrounds the equipment with a sufficiently large region of insensitivity as to make it immune to the movement of any nearby objects which would normally disturb conventional CW systems.

(2) An automatic checking device is built into the system and this continuously monitors the overall performance of the set. By this means operational accuracy is ensured and there is immediate warning information in the event of a fault arising in any part of the apparatus.

(3) A memory facility is incorporated in the system to ensure continuity of indication in the event of temporary interruption for any reason in the received signal. While the system is in "memory" the groundspeed and drift indications will remain operating at the last recorded values until such time as a received signal is available for interpretation. The system will automatically resume operation on receipt of a valid signal.

The tracking of the signal is accomplished by means of a comparison of the frequency of a highly stable variable oscillator with that of the received Doppler spectrum. The frequency of this oscillator is varied by means of a potentiometer. The shaft position of the potentiometer determines the groundspeed indication.

The drift measurement is obtained by orienting the antenna in such a way as to have same Doppler shifts from the left and right beams of the antenna. When this condition exists the antenna is aligned on the track.

For some types of digital computer (not part of the sensor) it is more satisfactory to have pulses instead of a shaft analogue of groundspeed. These can be obtained directly from the tracker oscillator.

By virtue of employing a moving antenna system, the circuitry and associated components are considerably simplified —which results in a far higher degree of reliability as well as making the servicing easier and more economical.

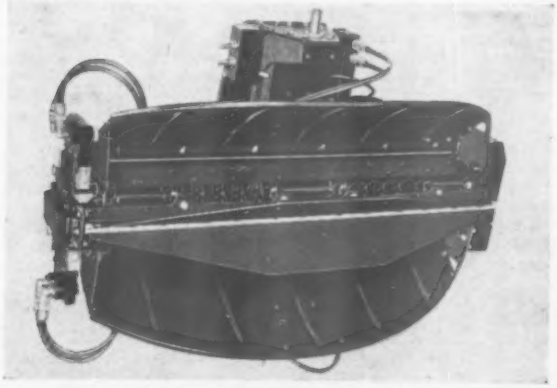
A Doppler system designed around a moving antenna can produce the desired information without the need for electronic circuits to resolve the phase relationships of a fixed antenna system and thus far fewer valves or transistors, together with their associated circuitry, are employed. Because of the relatively small number of valves and circuits in the CMA 620 Series, dependability has reached an exceptionally high level—in fact sets are in use today with over 3,000 operational hours to their credit and in which all the original valves, including the klystron, are still operating.

It is common knowledge that Doppler operation over smooth water is less effective than over normal terrain, but here is one of the most important advantages of the Canadian Marconi CMA 623 system; further to the equipment being able to be used in normal "sea" operation, an automatic device comes into action if the signal contained is insufficient due to the reflecting surface. The aerial then assumes an even greater angle and ensures practical continuous operation. In the short period that the receiver is out of service, it is being covered by the automatic "memory" mentioned.

The associated computer is programmed for deliveries of normal production units before the end of November.

*Aeronautical Radio Incorporated.

Right, groundspeed and drift indicator —twin-needle type. Below, control unit.



Canadian Marconi Doppler antenna assembly.

Book Reviews

COME NORTH WITH ME. An Autobiography by Bernt Balchen. 318 pp., 5¼ in. by 8¼ in. Illustrated. Hodder and Stoughton, Ltd. Price 21s.

IT is interesting to speculate why the name of Bernt Balchen has never rung around the World as have those of his contemporaries, the great pioneers of the Golden Twenties—Amundsen, Byrd, Lindbergh, Earhart, and so many others. Perhaps it was because he was a young Norwegian (born in 1900) who flew with Americans and so didn't rate as much publicity as did the native sons. He was certainly out of the picture when it came to handing out medals, a point he makes in the book.

Balchen, skier, boxer, amateur painter, was always fascinated by the Polar challenge, and after learning to fly with the Royal Norwegian Naval Air Service he joined Amundsen's party in 1925 for its third attempt to fly over the North Pole, but was off-loaded. Then Byrd took him to the U.S.A., where he eventually became an American citizen. With Byrd he flew the Atlantic to Paris, but bad weather and, according to Balchen, Byrd's bad judgment, compelled a diversion back to the French coast, where they made a safe night ditching. Later, in another of the famous Fokker tri-motor monoplanes, they made the first flight over the South Pole. In 1949 Balchen flew a C-54 over the North Pole, on the strength of which he claims to be the first man to fly over both the Poles. Yet in this very book he records Byrd's North Pole flight of 1926.

In North America he worked for Tony Fokker, including a period of hazardous bush-flying in Ontario, and later became the mercurial Dutchman's chief test pilot. Then, with Hjalmar Riiser-Larsen, he helped form D.N.L., the Norwegian airline which later merged with the national airlines of Sweden and Denmark to become S.A.S., and he tells how Imperial Airways prevented D.N.L. from starting an Atlantic service in the mid-'30s. His commercial and polar interests took him to Russia and Germany, whose citizens were no more to his liking than they are to any Scandinavian's. Then came the War; he ferried flying-boats across the Pacific, set up Bluie West staging post in Greenland, and organized and flew supply drops to the Norwegian Resistance, based first at Leuchars, Scotland, then at Bromma, Stockholm.

He takes a pretty poor view of the English, but I'm prepared to forgive him and the occasional naïvety of his writing, for he is a brave and capable flying man who has accomplished much, known legendary people, operated in the most God-forsaken places and assembled it all into a fascinating story of the greatest polar flier of all time.—WREN.

UPPER AIR TEMPERATURE OVER THE WORLD. By N. Goldie and E. E. Austin. 228 pp. 8¼ in. by 11 in. Illustrated with charts and diagrams. Her Majesty's Stationery Office. Price 30s.

IN order to meet the increasing need for information about the upper air, this modestly described "memoir" assembles information about the distribution of high-level temperature and its daily and seasonal variation throughout the World.

The book is divided into two parts—the first dealing with averages and the second with the variability of individual values. The information and interpolations, offered in the main in the form of charts, have been developed from upper-air soundings made chiefly between 1941 and 1952.

SPACE WEAPONS (A Handbook of Military Astronautics). Chief editor, John F. Loosbrock. 245 pp. Illustrated. Thames and Hudson. Price 30s.

AFTER a recent congressional hearing on space-flight an American physicist was asked what he thought we might find when we got to the Moon. "Russians!" he replied.

This reaction eminently sums up the theme of this book—the fear that Russia will gain control of space and thereby steal a military advantage over the U.S. The editors of *Air Force Magazine*, who produced the book, are supported in their thesis by some of America's leading Air Force generals, while the thoughts and ideas of scientists and engineers on the ways and means of astronautics are included for good measure.

Dr. James H. Doolittle begins by predicting that the end of the century will see not only landings on the Moon but successful two-way flights to Mars and Venus.

First blow for the U.S.A.F. is landed by Gen. Thomas D. White, who writes: "We cannot permit the dominance of space by those who have repeatedly stated they intend to crush the free world. . . . I believe that the United States' capability to control space could ultimately approach absolute deterrence . . . space is but an extension of the Air Force's natural element."

Gen. Thomas S. Power takes up the rôle of Strategic Air Command, its "more than 2,700 bombers and tankers" and the intercontinental ballistic missiles soon to enter service. The General does not see ICBMs radically altering the general picture of S.A.C.'s deterrent policy for some time, but suggests that, for the forseeable future, missiles will supplement and complement rather than replace the manned bomber.

Next Richard E. Horner, Assistant Secretary to the Air Force, Research and Development, outlines the problems behind the development of ballistic missiles. A big future is predicted for first-generation IRBMs and ICBMs when retired from duty, which should not suffer "the blow-torch fate common to retired aircraft," but will have great value as upper staging for future space-projects.

Space-medical problems are discussed by Dr. Hubertus Strughold of the U.S.A.F. School of Aviation Medicine, who suggests that protracted space-journeys by manned vehicles will require new methods for regeneration of air, perhaps by means of natural or artificial photosynthesis replacing chemical systems.

In addition, the editors of "Space Weapons" find room for a general appraisal of space-flight techniques, suggesting ways in which existing military rockets may be adapted for various space-missions such as sending instruments out to the nearer planets. The utility of Earth-satellites is also discussed.

The North American X-15 is regarded as the forerunner of manned orbital vehicles, for which design work is already proceeding. The Dyna-Soar project, for example, is described as a "boost-glide vehicle . . . thrown into orbit with existing propulsive hardware, that could circle the Earth several times at an altitude of 100 to 200 miles . . . gliding in and out of the atmosphere for braking effect . . . and dropping a 5,000-lb. payload anywhere in the World."

Looking even farther ahead, Krafft Ehriche, of Convair Astronautics, describes a design study for a three-stage vehicle for supplying manned space-stations. The first stage would be a large multi-engined jet aircraft taking off horizontally and delivering a two-stage vehicle—carried under its fuselage—to an altitude of 60,000 ft. at a speed of about Mach 3.0. Stage two would be a liquid chemical rocket (LOX/JP-fuel) and stage three would be powered by a nuclear reactor using ammonia as "working fluid"; both would be fitted with wings.

Advantages claimed for this combination include recovery of *all* stages and maximum safety and reliability at take-off. For a payload of approximately 3,000 lb., Ehriche estimates that together the two rocket stages would weigh between 150,000 and 170,000 lb., but no figures are given for the huge supersonic aircraft needed to launch them.

Many of the arguments included in "Space Weapons" seem to take their inspiration from science-fiction. Will the Moon really become a missile base that "will dominate the Earth," or near-space a battleground for orbiting satellites of opposing nations? Only time will tell. Meanwhile, one can only hope that the economic strain of keeping up with Ivan will not prove more lethal to America than the prospective Space-War.—K.W.G.

DIE ENTWICKLUNG DER FLUGZEUGE, 1914-1918. 144 pp. Illustrated. Heinz Nowarra (Lehmann, Munich). Price 45s.

EXCELLENTLY bound in pale blue plastics and well printed on good quality paper, this book will nevertheless disappoint British readers on closer inspection. It consists mainly of data in tabulated form, and with the author's Preface repeated in English, language is not in itself a serious deterrent; but the heavily retouched photographs seem to be a poor selection from what is claimed to be a much larger array.

The text, although obviously the result of much sustained diligence, hardly suggests a background of critical and informed research; material has been accepted at its face value, classic "clangers" are perpetuated, and slipshod proof-correction is all too evident. The German section of 59 pp. and 71 illustrations is probably better than the remainder, as it should be, but the British section of 21 pp. and 21 illustrations contains, for instance, "Boulton and Paul, Ltd., *Wolverhampton*," "Austin Greyhound . . . . *Dreidecker*," "Dyott *XXX*" and finally "Al*cook*-Brown."

Even those to whom money is no object may well hesitate before parting with 45s. for this very slim volume, unless, of course, they already have a complete set of "Taschenbücher de Luftflotten" and cannot bear the sight of that 1914-1918 gap any longer!—SENRAB.

Correspondence

Helping the Business Flyer

WE have noted with interest the letter from Mr. C. G. Strasser, reproduced in your issue of Sept. 18, on the subject of Personal Flying.

We, as a company, have long appreciated the need for a wholly independent and unbiased advisory organization to which prospective owners of business and private aeroplanes could apply for information. It is with this fact in mind that W. S. Shackleton Ltd. has rejected offers of appointment as sole agents on behalf of overseas aircraft manufacturers, as we prefer to advise our clients without any prejudice towards one make or another. To this end we have, in recent months, prepared a number of detailed costings for different types of foreign light aircraft, which have been requested by business companies and private individuals trying to decide upon the aeroplane most suited to their needs.

We would like to add that articles contained in THE AEROPLANE AND ASTRONAUTICS, subsequent to our sales week-end at Kidlington early this year, have encouraged us tremendously to extend this service still further. Should Mr. Strasser or any other reader care to address any queries they have for our attention, we would gladly do all we can to assist them.

London, W.1. F. A. DISMORE,
General Manager, W. S. Shackleton Ltd.

Nos. 16, 44 and 158 Squadrons

THE history of No. 16 Squadron is one of a number of R.A.F. squadron histories I have selected for a book I am working on, and amongst the notes I have prepared are one or two interesting items which call for more detailed information and personal knowledge. It would be appreciated, therefore, if I could appeal through the columns of your journal to any old member of "Sixteen" who may be able to assist.

Throughout the heavy fighting in France in 1940 No. 16 Squadron lost a third of its strength in an effort to complete the tasks set them. At one stage in the battle a Sqn. Ldr. Skelton flew over the lines in a Tiger Moth to complete some successful artillery shoots. Can anyone give more details about this gallant officer and the actions he carried out? Also, on what date in June, 1941, was Wg. Cdr. Hancock killed, and who was the air gunner in Sqn. Ldr. Walker's Lysander when they were shot down by Me.109s over Exmouth?

During the last six months of 1944 the Squadron experienced a casualty turnover of 75%. Information on events covering this period would be appreciated.

No. 44 Squadron. Can any ex-member of this unit recall the early days in 1917/1919?

No. 158 Squadron. Was its number really used at any time in 1918? Nucleus assembled at Driffield in May, 1942, and moved under Wg. Cdr. Robinson to Eastmoor in June, 1942, then on to Rufforth towards the end of the year. Information on its early "Ops" would be of interest, and also on the unfortunate incidents which resulted in "Q for Queenie" being scrubbed off the nominal roll for a short time.

Bridlington, East Yorks. J. L. DIXON.

Near-Forty Test Pilots

IT is of course generally known that top test pilots are seldom very young men, as it requires time to collect flying hours, engineering knowledge and wisdom. The list of Farnborough pilots in your issue of September 11 prompted me to do a little investigating, the result of which is as follows:—

Age group	Number of pilots
25-27 years	2
28-30 ,,	2
31-33 ,,	6
34-36 ,,	18
37-39 ,,	23
40-42 ,,	7
43-45 ,,	6
Above 45 years	1

From this it will be seen that the most strongly represented group is that from 34-39 years, with a total of 41 pilots, i.e. over 63%. The average age of British test pilots lies nearer the forties than the thirties. Separating out the group which at Farnborough flew the faster and more manœuvrable aircraft, it was also found to lie between 34 and 39 years; 14 out of a total of 23; i.e. 60%.

Considering that many of the pilots who flew the more sedate aircraft could, and do, equally well fly the faster types, the above supports the view that when a test pilot has a good physique, keeps himself fit and becomes a master at his job, the "climbing years" need not worry him overmuch.

The tentative conclusion would be that one should not think of a top job as a test pilot before one is 30 and consider a change by the time one reaches 45. But there are, luckily, exceptions. I wonder if anyone would care to give similar figures for other countries, such as France and the United States?

May those we admired so much at Farnborough continue the good work!

The Hague. J. VAN HATTUM,
(Secretary, Private Aviation and Air Touring Royal Dutch Aero Club).

Keep One Sunderland Flying

IT was very interesting to read Mr. Peter F. M. Thomas's letter regarding the Sunderland (THE AEROPLANE AND ASTRONAUTICS, August 21 last).

There are indeed many of us who would like to see the Sunderland at least in the Museum and, even better, flying occasionally. Mr. Thomas is assured of my support on this project.

London, W.1. D. C. PALMER.

Groundabout

Shady Miss-ile. From America comes a news item which indicates, unless there's a vital misprint, that certain colourful denizens of London's West End are organizing resistance against the recent clean-up. The Thiokol Chemical Corpn., Elkton, Md., it says, is to produce in large quantities a small, solid propellent counter-measures rocket called, so help me, the Tart.

*

PRO and CON—3. More P.R.O.-manship definitions according to the dictionary:—

PROclaim: To announce; to declare with honour—(". . . will fly faster, farther, higher slower," etc.).

PROcrastinate: To put off from day to day—("The firing of the Colossus missile, which was to have taken place today. . .").

PRObity: Tried virtue or integrity—(Well, they *try*).

PROcumbent: Lying face downwards—(No comment).

*

Dutch Bloomer. One of the nicest of the many requests received by British companies from boys in Holland was the one which began "Dear Sir—Please send me one of your pantlets. . . ."

*

When a test pilot, who lives on a houseboat, was asked by a non-aviation friend what he did about sanitation aboard, he replied "Oh, we rely on Elsan." Ignorant friend, after a doubtful pause: "What do you do with that—take it?"

*

Corny Comment. Sorry to hear that Tom Brooke-Smith, Short's chief test pilot, is grounded with some passing sickness. Nothing worse, I hope, than a touch of Farnborough hay fever.

*

CLEANING UP

by Gren

NOTES AND EVENTS

RADAR SIMULATORS.—The Royal Norwegian Navy has placed an order with Solartron Radar Simulators, Ltd., for a new six-target radar simulation system. This order follows closely the delivery of other radar simulation systems to the Governments of Germany, Italy and Sweden.

AIRCRAFT LIGHTING.—Thorn Electrical Industries, Ltd., has announced that as a result of an agreement between their subsidiary Atlas Lighting, Ltd., and Luminator Incorporated of America, they have acquired a licence for the manufacture and distribution of Luminator aircraft and other lighting fittings in this country. These products will be handled by the Components and Connector Division of Thorn Electrical Industries, Ltd.

CHANGE OF ADDRESS.—New offices at 23-24 King Street, London, S.W.1, are now occupied by the Dunlop Rubber Co., Ltd. The offices, built on the site formerly occupied by the St. James's Theatre, have been named St. James's House. The company's head office, St. James's House, at 25 Ryder Street, London, S.W.1, has been renamed Dunlop House.

AIRLINE BOOKING.—Trans-Canada Air Lines has ordered a fully transistorized computer system from Ferranti-Packard Electric, Ltd., Toronto, the wholly owned Canadian subsidiary of Ferranti, Ltd., for use in its new seat-reservation system which is expected to start operations in 1961. This follows the announcement made earlier this year that T.C.A. had placed a $2m. order with Ferranti-Packard Electric, Ltd., for booking-office and communications equipment.

AIRFIELD COMMUNICATIONS.—The Plessey Co., Ltd., has announced that the de Havilland Aircraft Co. is to install its UHF ground communication equipment at Hatfield. The Plessey AN/ARC-52 airborne UHF set, which is manufactured under licence from the Collins Radio Co., of America, is already being fitted in Service aircraft manufactured by D.H. Other companies who have so far been supplied with Plessey ground equipment are Armstrong-Whitworth Aircraft, Handley Page, English Electric, Blackburn and General Aircraft, Hawker Siddeley Group, Westland, Avro and Marshall's Flying Services, Cambridge.

REFUELLING EQUIPMENT.—Simmonds Aerocessories, Ltd., has entered into a licensing agreement with the Pryor Manufacturing Co., of Mansfield, Ohio, to manufacture hydrant fuel dispensers and general civil and military aircraft refuelling vehicles for World-wide territories, except the American continents.

ULTRASONICS FOR INDIA.—The Ultrasonoscope Co. (London) Ltd., has just delivered to India an automatic test rig for the ultrasonic inspection of turbine discs. It is claimed to be the first unit of its kind to be supplied to that country.

NEW DEXION NAMES.—Dexion, Ltd., makers of slotted angle and accessories, have changed the names of two of their products. "Tecton" is the new name for the engineered wood beams, previously known as "Tecon"; and "Open Steel Plank" replaces the name "Multi-Purpose-Grid" for Dexion's new all-purpose grid which can be used for anything from floor grids to steps or car ramps.

GOODYEAR EQUIPMENT.—The Aviation Products Division of the Goodyear International Corporation, Akron, Ohio, has recently published a new Aviation Products Manual for the World-wide use of the aviation industry. In this country the head office of The Goodyear Tyre and Rubber Co. (Great Britain), Ltd., is at Wolverhampton.

Aviation Calendar

October 6.—R.Ae.S. Boscombe Down Branch lecture, "Manpowered Flight," by B. S. Shenstone, Chief Engineer, B.E.A., at the Lecture Hall, A. and A.E.E., **Amesbury**, Wilts, at 17.30 hrs.

October 7.—R.Ae.S. Graduates' and Students' Section lecture, "Lunar Probes," by J. E. Allen, at the Library, 4 Hamilton Place, **London**, W.1, at 19.30 hrs.

October 7.—R.Ae.S. Weybridge Branch lecture, "Fatigue in Modern Aircraft Structures," by D. M. McElhinney, A.F.R.Ae.S., at the Apprentice Training School, Vickers-Armstrongs (Aircraft), Ltd., **Weybridge**, at 18.10 hrs.

October 7.—British Institution of Radio Engineers lecture, "The Use of Transistors in Communication and Control," by E. Wolfendale, B.Sc., at the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, **London**, W.C.1, at 18.30 hrs.

October 8.—University of London extra-mural studies lecture, "Thermal Winds and Jetstream Forecasting," by C. E. Wallington, M.Sc., at the Kronfeld Club, Basement, 74 Eccleston Square, **London**, S.W.1.

October 9.—Helic. Assn. of Gt. Britain lecture, "The Programme of Development Testing for a Helicopter," by T. G. G. Newbery, B.Sc.(Eng.), A.M.I.Mech.E., A.F.R.Ae.S. (Ministry of Supply), at the Library, 4 Hamilton Place, **London**, W.1, at 18.00 hrs.

October 13.—R.Ae.S. lecture, "Instruments and Flight Control Systems for Transport Aircraft," by W. H. McKinley, at Napier Senior Staff Canteen, **Luton Airport**, at 18.15 hrs.

October 14.—Society of Instrument Technology lecture, "An Automatic Analogue Computer for Missile Homing Investigations," by J. G. Thomason, B.Sc., A.Inst.P., A.M.I.E.E., at Manson House, 26 Portland Place, **London**, W.1, at 18.30 for 19.00 hrs.

October 17.—R.Ae.S. Luton Branch, visit to the Shuttleworth Collection at **Old Warden.**

October 21.—British Institution of Radio Engineers lecture, "Aviation Medicine," by P. V. Byford, at London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, **London**, W.C.1, at 18.30 hrs.

October 22.—University of London extra-mural studies lecture, "T/gram; Fair-weather Clouds," by Dr. R. S. Scorer, M.A., Ph.D., at the Kronfeld Club, Basement, 74 Eccleston Square, **London**, S.W.1.

October 22.—R.Ae.S. lecture, "Problems of Interplanetary Navigation," by T. R. F. Nonweiler, at Church House, Westminster, **London**, S.W.1, at 19.00 hrs.

October 22.—R.Ae.S. Isle of Wight Branch lecture, "Air Traffic Control and Jet Operations," by H. E. Smith, at the Clubhouse, Saunders-Roe Sports and Social Club, Church Path, **E. Cowes**, at 18.00 hrs.

Personal Notices

BIRTHS

Chandler.—On September 13, to Jane (*née* Irving), wife of Flt. Lt. M. R. T. Chandler, R.A.F. Aden—a son (Paul).

Dove.—On September 17, at R.A.F. Hospital Akrotiri, Cyprus, to Anne (*née* Morgan), wife of Dr. J. R. Dove, R.A.F.—a daughter.

Evans.—On September 18, at Epsom District Hospital, to Margot, wife of Sqn. Ldr. D. G. Evans, R.A.F.—a daughter.

Francis.—On September 17, at Lambeth Hospital, S.E.11, to Jean (*née* MacNeece Foster), wife of Sqn. Ldr. C. P. Francis, R.A.F.—a daughter (Deborah).

Levers.—On September 18, at R.A.F. Hospital, Nocton Hall, to Jean (*née* Knight), wife of Flt. Lt. P. E. Levers, M.B., B.S., R.A.F.—a son (Glen Eskett).

Miller.—On August 20, at Singapore, to Annette (*née* Holland), wife of Tony Miller, R.A.F.—a son (Ashley Glen).

Simpson.—On September 20, at Bushclose, Boughton, Northampton, to Patricia (*née* Tite), wife of Flt. Lt. P. Simpson—a son.

Twibill.—On September 19, at 22 Beresford Rd., Newhaven, to Jill (*née* Warrick), wife of Flt. Lt. M. Twibill, R.A.F.—a son.

DEATH

Heyworth.—On September 21, suddenly at The Lawns, Kirk Langley, Derbyshire, Wg. Cdr. J. H. Heyworth, A.F.C.

Company Notices

New Patents

APPLICATIONS ACCEPTED

823,391.—Schermuly Pistol Rocket Apparatus.—"Dischargers for pyrotechnic devices."—June 4, 1957. (March 5, 1956.)

823,529.—Fairey Aviation Co., Ltd.—"Aircraft."—July 12, 1956. (July 25, 1955.)

823,591.—Power Jets (Research and Development), Ltd.—"Aircraft flying control systems."—Sept. 14, 1956. (Sept. 28, 1955.)

823,592.—Power Jets (Research and Development), Ltd.—"Aircraft powered by turbo-prop engines."—Sept. 14, 1956. (Sept. 28, 1955.)

823,593.—Power Jets (Research and Development), Ltd.—"Aircraft controls."—Sept. 14, 1956. (Sept. 28, 1955.) (Divided out of 823,591.)

823,302.—United Aircraft Corporation.—"Jet propulsion engine exhaust silencers."—March 19, 1957. (March 29, 1956.)

Printed specifications of the above will be available on November 11, 1959, and the opposition period will expire on February 11, 1960.

NEW COMPANIES

Wall-Wide Travel, Ltd. (636,021).—Private co. Reg. August 28. Cap. £1,000 in £1 shs. Travel agents and to supply guides and to organize and conduct tours and excursions of all kinds, etc. Directors: Louis Wall, 35 Shoot-up Hill, N.W.2; Max Rosoff, Saryon, Israel; Benjamin Plascow, 32 Lilienblum Street, Tel-Aviv, Israel. Sec.: Louis Wall. Reg. off.: 37 Harley Street, W.1.

General Cargo Brokers (Mercia), Ltd. (636,114).—Private co. Reg. August 31. Cap. £2,000 in £1 shs. General carriers of passengers and goods by land, water or air, etc. Subscribers (each with one share): Edward A. Feazey, Pilgrims Cottage, 18 Station Road, Billericay, Essex, cashier; Dennis B. Cox, 50 Dale View Crescent, Chingford, E.4, solicitor's clerk. First directors are to be appointed by the subscribers. Solrs.: Wm. M. Ingram, Hull.

Edward Seymour, Ltd. (636,393).—Private co. Reg. September 5. Cap. £100 in £1 shs. Consultants, civil, mechanical, automobile, electrical, aeronautical, electronic, heating, ventilating and general engineers, etc. Subscribers (each with one share): E. O. Davies, 107 Culver Gardens, Stanmore, Middlesex, clerk; J. Mills, 60 Dewsbury Road, Dollis Hill, N.W.10, clerk. Solrs.: J. D. Langton and Passmore, 8 Bolton Street, W.1.

Helicopter Consultants, Ltd. (636,406).—Private co. Reg. September 3. Cap. £100 in £1 shs. Operators and agents for the sale of aircraft and helicopters, consultants regarding the running of helicopters, etc. Directors: Alan B. H. Yowell and Louis de Loriol, both of 119 Piccadilly, W.1. Secretary: Alan B. H. Yowell. Reg. off.: 180 Brompton Road, S.W.3.

Trans Australian Air Coach, Ltd. (636,439).—Private co. Reg. September 3. Cap. £100 in £1 shs. Aerial communications, etc. Directors: Thomas M. Wilson, Broomhill Court, Broomhill Close, Esher; Chone H. Dredzen, 3 Templeton Place, S.W.5; Ronald Myhill, Augustine B. Dromgoole. Secretary: R. Lobatto. Solrs.: Barnett Janner and Co., W.C.1. Reg. off.: 19 Grand Arcade, Trafalgar Square, W.C.2.

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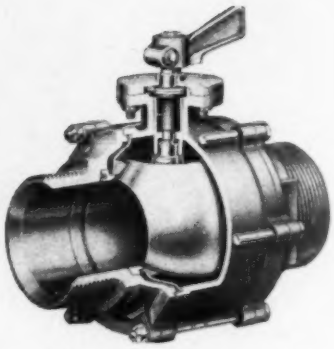

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AIR TRANSPORT ADVISORY COUNCIL.

THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM SKYWAYS COACH AIR, LTD., OF 7 BERKELEY ST., LONDON, W.1:—

APPLICATION NO. 3225 for a Normal Scheduled Service initially with DC-3 and Hermes aircraft and later also with Avro 748 aircraft for the carriage of passengers, supplementary freight and mail on the route Lympne and/or Manston-Lyons-Frejus (St. Raphael) at an initial frequency of seven return flights weekly increasing later to 21 return flights weekly, for 10 years from April 1, 1960.

FROM DERBY AVIATION, LTD., OF DERBY AIRPORT, BURNASTON, DERBY:—

APPLICATION NO. 3226 for a seasonal U.K. Internal Service for the carriage of passengers, supplementary freight and mail on the route Swansea-Guernsey and/or Jersey at an initial frequency of seven return flights weekly with Dakota aircraft, or 14 return flights weekly with Marathon aircraft, increasing later in accordance with traffic demand, from April to October each year, for seven years from 1960.

APPLICATION NO. 3233 for amendments to the terms of approval of the following seasonal Normal Scheduled Services so as to enable them to operate the services from Swansea and/or Cardiff and/or Bristol:—

APPLICATION NO. 2370 approved on the route Cardiff and/or Bristol-Nice.

APPLICATION NO. 2371 approved on the route Cardiff and/or Bristol-Palma.

APPLICATION NO. 2372 approved on the route Cardiff and/or Bristol-Perpignan.

APPLICATION NO. 2373 approved on the route Cardiff and/or Bristol-Luxembourg.

APPLICATION NO. 2419 approved on the route Cardiff-Bristol (Opt.)-Ostend.

FROM BRITISH OVERSEAS AIRWAYS CORPORATION OF LONDON AIRPORT, HOUNSLOW, MIDDLESEX:—

APPLICATION NO. 3223 for permission to include traffic stops at Zurich or Geneva, and at Damascus from November 1, 1959, on their Normal Scheduled Service on the route London-Frankfurt or Dusseldorf and/or Rome-Tel Aviv-Teheran (Reserved Route No. 8 in Schedule "A" Part 1 of the Terms of Reference issued to the Council by the Minister of Civil Aviation on July 30, 1952).

These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. 502-6

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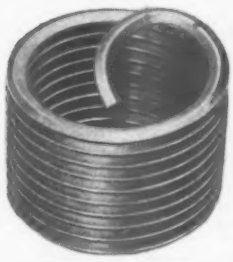

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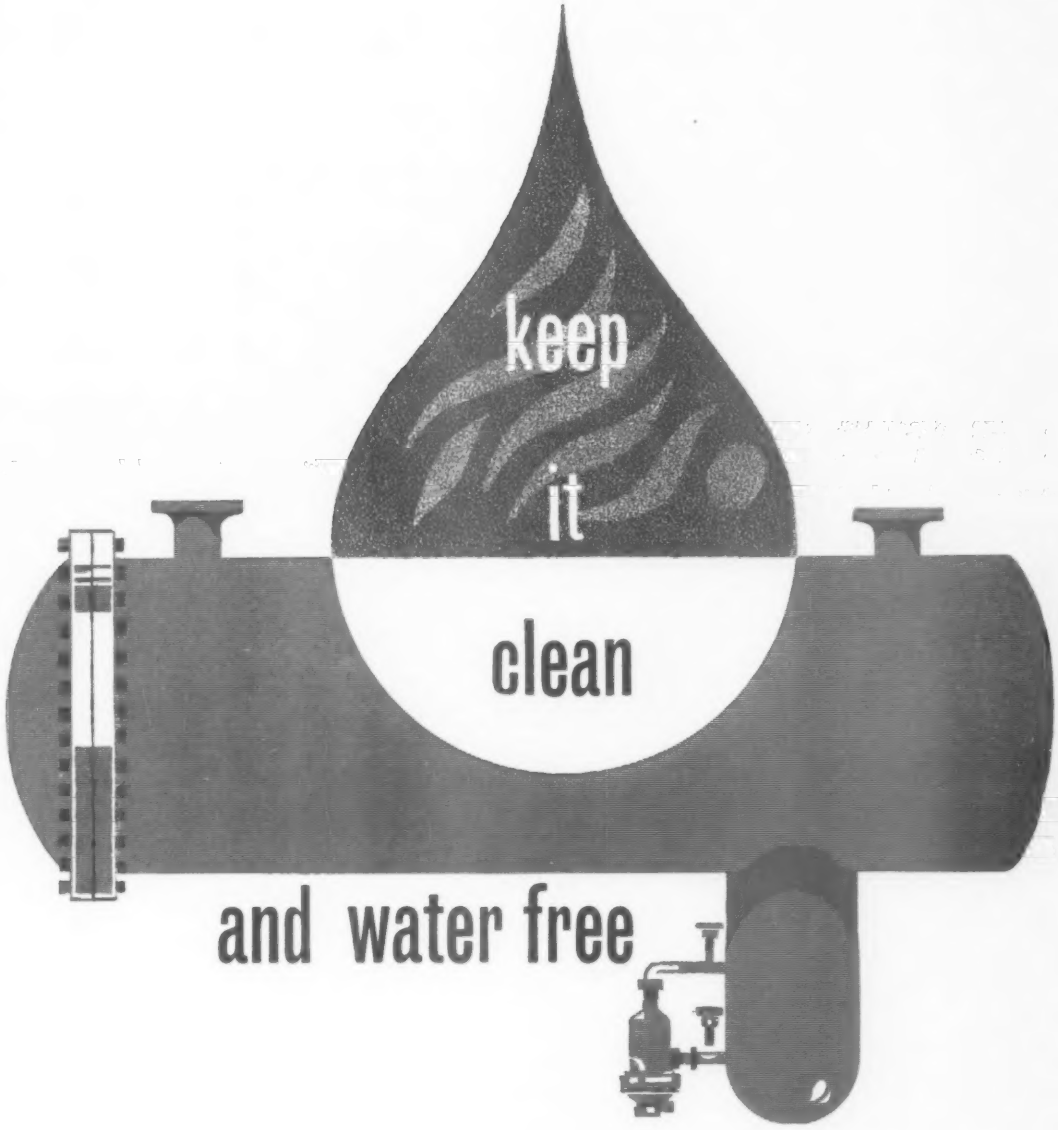

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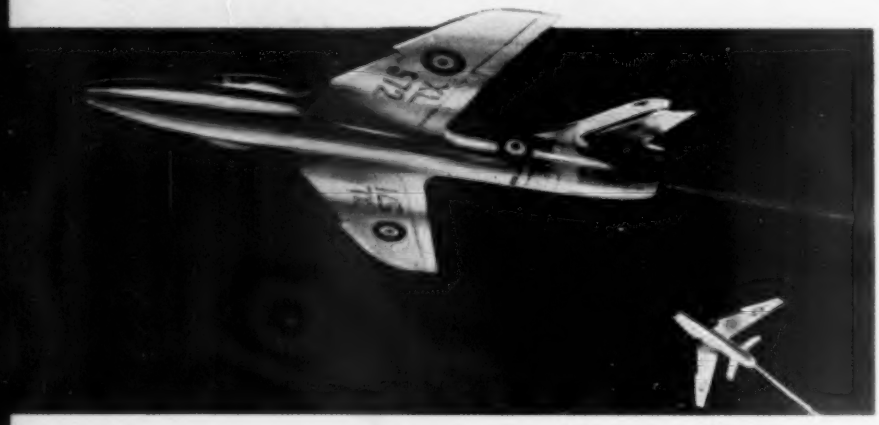

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